Chapter 7 Powers Roots and Radicals

Ex 7.3

Answer 1e.

We know that the value of e is approximately 2.718281828. Since the decimal neither repeats nor terminates, we can say that the number e is an irrational number. Therefore, the statement can be completed as, "The number e is an irrational number and approximately equal to 2.71828".

Answer 1gp.

Apply the product of powers property.
$e^7 \cdot e^4 = e^{7+4}$

Simplify the exponent.
$e^{7+4} = e^{11}$

Thus, the given expression simplifies to e^{11}.

Answer 1q.

The given equation is of the form $y = ab^{x-h} + k$. We can graph these functions by first graphing the function $y = ab^x$.

First, graph $y = 2 \cdot 3^x$. Substitute 1 for x and find the y-value.

$$
\begin{aligned}
y &= 2 \cdot 3^1 \\
&= 2 \cdot 3 \\
&= 6
\end{aligned}
$$

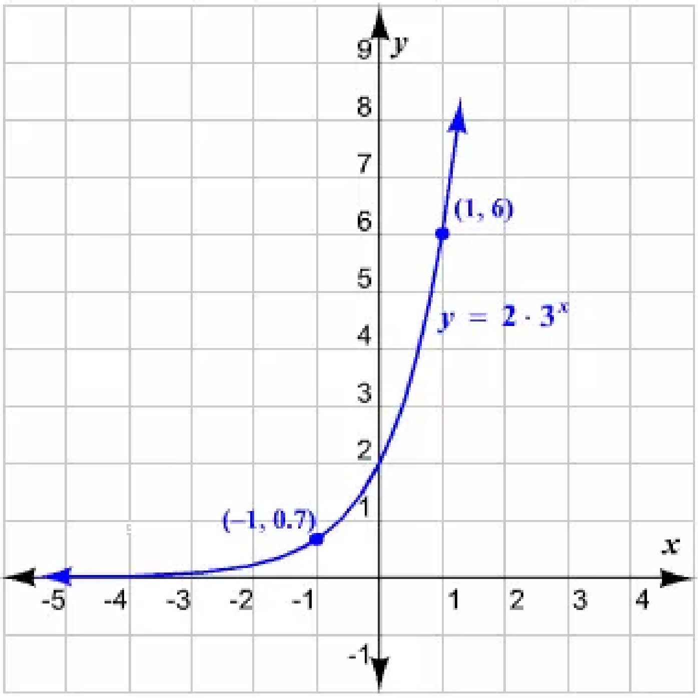
One point on the graph is (1, 6).

Put another value for x, say, −1 and find the y-value.

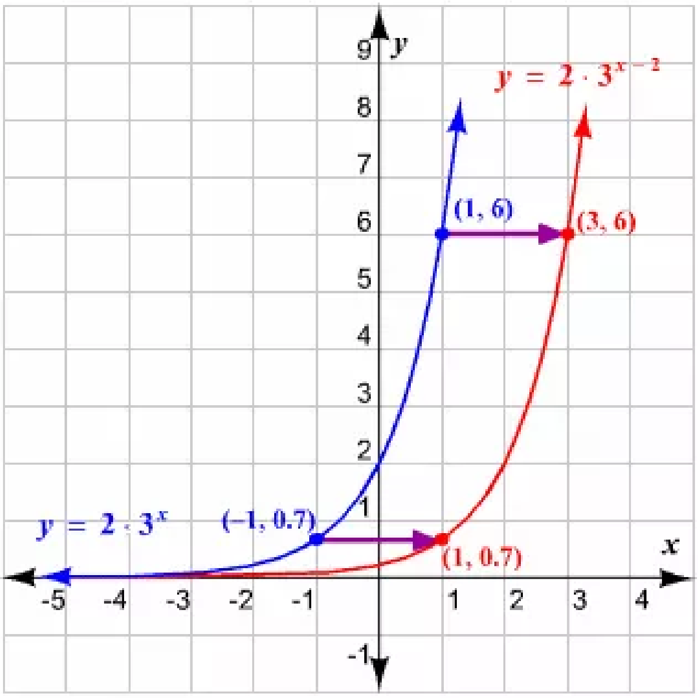
$$
\begin{aligned}
y &= 2 \cdot 3^{-1} \\
&= 2 \cdot \frac{1}{3} \\
&\approx 0.7
\end{aligned}
$$

Another point on the graph is (−1, 0.7).

Plot these points and connect them with a smooth curve.



The given function is obtained when $y = 2 \cdot 3^x$ is shifted 2 units to the right. The new points will thus be (−1, 0.7) and (1, 6).



Domain is the set of x-values and range is the set of y-values of a function.

The x- and y- values can be found by observing the graph of the function. It is clear from the graph that all real numbers are included in the domain. Thus, the domain is the set of all real numbers.

We can see that the graph has its asymptote at $y = 0$. Thus, the range is $y > 0$.

Answer 2e.

Consider the following function,

$$f(x) = \frac{1}{3}e^{4x}$$

A function of the form $y = ae^{rx}$ is called a natural base exponential function.

- If $a > 0$, and $r > 0$, the function is an exponential growth function.
- If $a > 0$, and $r < 0$, the function is an exponential decay function.

The given function $f(x) = \frac{1}{3}e^{4x}$ is an $\boxed{\text{exponential growth}}$ function because $a = \frac{1}{3}$ is positive and $r = 4$ is positive.

Answer 2gp.

Simplifying the expression:

$$2e^{-3} \cdot 6e^{5} = 2 \cdot 6 \cdot e^{-3+5} \quad \text{Use properties of exponents}$$

$$= 12e^{2} \quad \text{Simplify}$$

Thus the solution is $\boxed{12e^2}$.

Answer 2q.

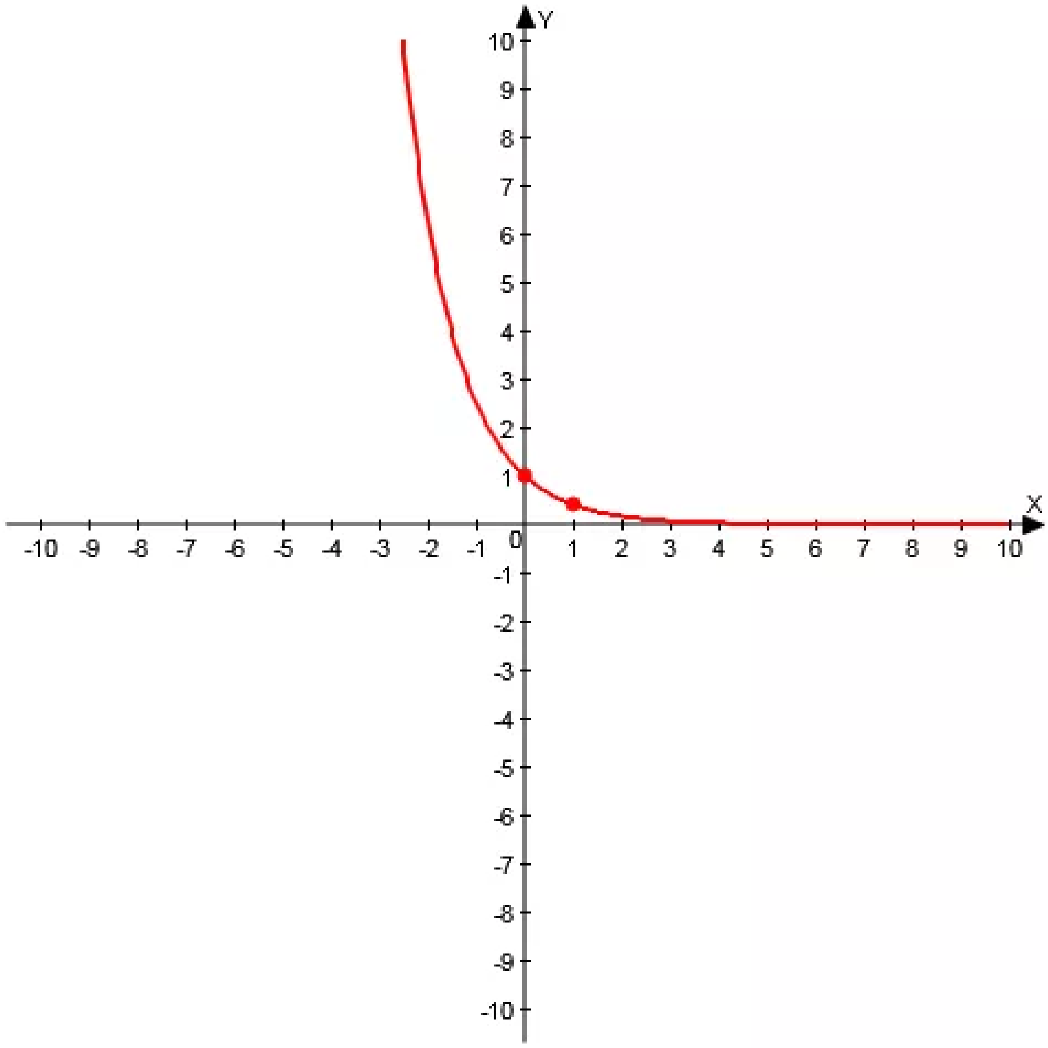
Graphing the function:

$$y = \left(\frac{2}{5}\right)^x$$

Making the table:

x	0	1
y	1	0.4

Plot two points $(0,1)$ and $(1,0.4)$, and draw a smooth curve from right to left from just above the x-axis, through the plotted points, and continuing up and to the left.



The domain is all real numbers and the range is $y > 0$.

Answer 3e.

Apply the product of powers property.
$e^3 \cdot e^4 = e^{3+4}$

Simplify the exponent.
$e^{3+4} = e^7$

Thus, the given expression simplifies to e^7.

Answer 3gp.

Apply the quotient of powers property.
$$\frac{24e^8}{4e^5} = \frac{24}{4}e^{8-5}$$
$$= 6e^{8-5}$$

Simplify the exponent.
$6e^{8-5} = 6e^3$

Thus, the given expression simplifies to $6e^3$.

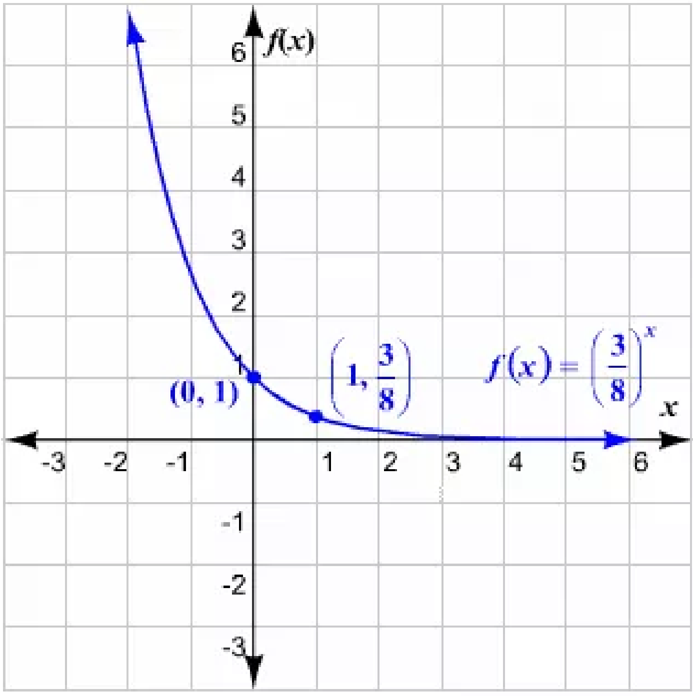
Answer 3q.

The given equation is of the form $y = ab^{x-h} + k$. We can graph these functions by first graphing the function $y = ab^x$.

First, make a table of values to graph $f(x) = \left(\frac{3}{8}\right)^x$. Choose some x-values and find the corresponding y-values. Organize the results in a table as shown.

x	0	1
y	1	$\frac{3}{8}$

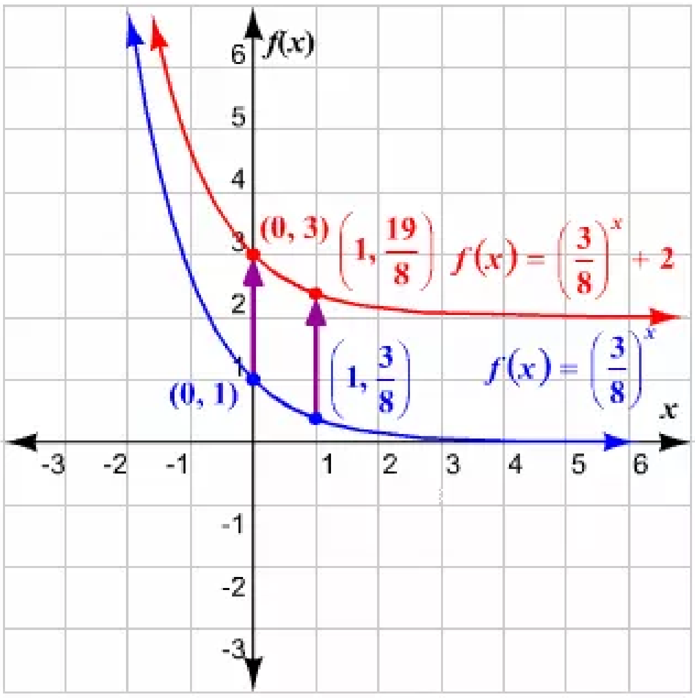
Plot these points and connect them with a smooth curve.



The graph of the given function is obtained by translating the graph of $f(x) = \left(\frac{3}{8}\right)^x$ upward by 2 units. List the new points in another table.

x	0	1
y	3	$\frac{19}{8}$

Draw the graph of $f(x) = \left(\frac{3}{8}\right)^x + 2$ using these points.



Domain is the set of x-values and range is the set of y-values of a function.

The x- and y- values can be found by observing the graph of the function. It is clear from the graph that all real numbers are included in the domain. Thus, the domain is the set of all real numbers.

We can see that the graph is defined only for y-values greater than 0. Thus, the range is $y > 0$.

Answer 4e.

Consider the expression,

$$e^{-2} \cdot e^{6}$$

Simplify the above expression as follows:

$$e^{-2} \cdot e^{6} = e^{-2+6}$$ From the laws of exponents, $a^m a^n = a^{m+n}$

$$= e^{4}$$

Therefore, the simplified form of the given expression is $\boxed{e^4}$.

Answer 4gp.

Simplifying the expression:

$$\left(10e^{-4x}\right)^3 = 10^3 e^{-4x\cdot 3} \quad \text{Use power of power property}$$

$$= 10^3 e^{-12x} \quad \text{Simplify}$$

$$= \frac{1000}{e^{12x}} \quad e^{-12x} = \frac{1}{e^{12x}}$$

Thus the solution is $\boxed{\frac{1000}{e^{12x}}}$.

Answer 4q.

Simplifying the expression:

$$3e^4 \cdot e^3 = 3e^{4+3} \quad \text{Use properties of exponents}$$

$$= 3e^7 \quad \text{Simplify}$$

Thus the solution is $\boxed{3e^7}$.

Answer 5e.

Apply the power of a product property.

$$\left(2e^{3x}\right)^3 = 2^3\left(e^{3x}\right)^3$$

Evaluate 2^3.

$$2^3\left(e^{3x}\right)^3 = 8\left(e^{3x}\right)^3$$

Apply the power of a power property.

$$8\left(e^{3x}\right)^3 = 8e^{3x\cdot 3}$$

Simplify the exponent.

$$8e^{3x\cdot 3} = 8e^{9x}$$

Thus, the given expression simplifies to $8e^{9x}$.

Answer 5gp.

First, you have to press the $\boxed{\text{2nd}}$ key on a calculator. Then, press the $\boxed{e^x}$ key.

Next, press the key $\boxed{(}$, enter 3, press $\boxed{\div}$, 4, and $\boxed{)}$ keys.

Finally, press the $\boxed{\text{ENTER}}$ key to get the result.

The display is 2.117000017. This result might vary slightly depending on the calculator you use.

Round the result to the nearest thousandth.
$2.117000017 \approx 2.12$

Thus, the value of $e^{3/4}$ is about 2.12.

Answer 5q.

Apply the power of a product property.
$$\left(-5e^{3x}\right)^3 = (-5)^3\left(e^{3x}\right)^3$$

Evaluate 2^3.
$$(-5)^3\left(e^{3x}\right)^3 = -125\left(e^{3x}\right)^3$$

Apply the power of a power property.
$$-125\left(e^{3x}\right)^3 = -125e^{3x\cdot 3}$$

Simplify the exponent.
$$-125e^{3x\cdot 3} = -125e^{9x}$$

Thus, the given expression simplifies to $-125e^{9x}$.

Answer 6e.

Consider the following expression,
$$\left(2e^{-2}\right)^{-4}.$$
Simplify the above expression as follows:

$$\left(2e^{-2}\right)^{-4} = (2)^{-4}\left(e^{-2}\right)^{(-4)} \qquad \text{From the laws of exponents, } (ab)^m = a^m b^m$$
$$= 2^{-4}e^{8} \qquad \text{From the laws of exponents, } \left(a^m\right)^n = a^{mn}$$
$$= \frac{e^8}{2^4} \qquad \text{From the laws of exponents, } \left(a^{-m}\right) = \frac{1}{a^m}$$
$$= \frac{e^8}{16} \qquad \text{Since, } 2^4 = 16$$

Therefore, the simplified form of the given expression is $\boxed{\dfrac{e^8}{16}}$.

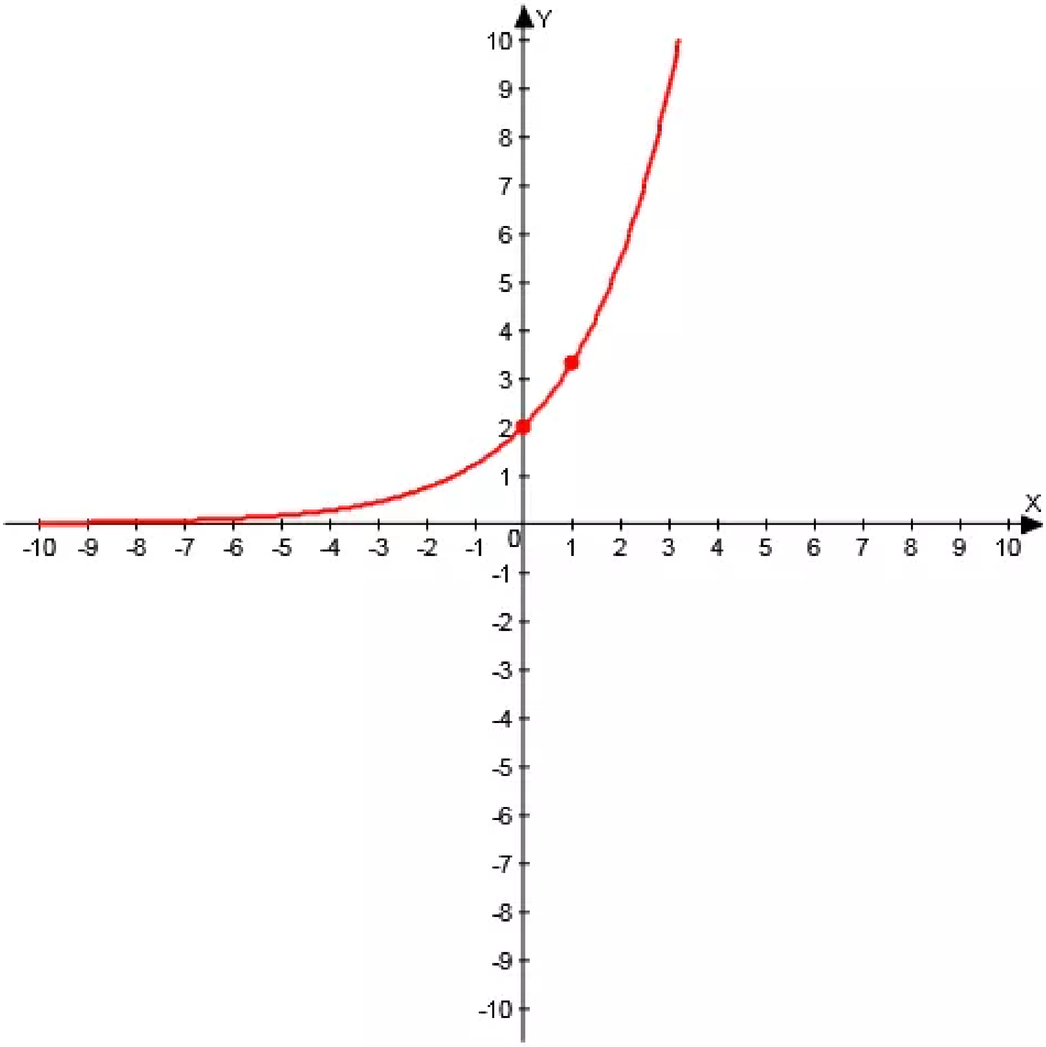
Answer 6gp.

Graphing the natural base function:

$y = 2e^{0.5x}$

The function $y = 2e^{0.5x}$ is in the form $y = ae^{rx}$ where in this case $a = 2$ is positive and $r = 0.5$ is positive, the function is an exponential growth function.

Plot the points $(0, 2)$ and $(1, 3.3)$, and draw the curve:



The domain is all real numbers, and the range is $y > 0$.

Answer 6q.

Simplifying the expression:

$$\frac{e^{4x}}{5e} = \frac{1}{5}e^{(4x-1)} \qquad \text{Use quotient property}$$

$$= \frac{e^{4x-1}}{5} \qquad \text{Simplify}$$

Thus the solution is $\boxed{\frac{e^{4x-1}}{5}}$.

Answer 7e.

Apply the quotient of powers property.

$$\left(3e^{5x}\right)^{-1} = \frac{1}{3e^{5x}}$$

Thus, the given expression simplifies to $\frac{1}{3e^{5x}}$.

Answer 7gp.

The graph of the function $y = \frac{1}{2}e^{-x} + 1$ is obtained by translating the graph of $y = \frac{1}{2}e^{-x}$ one unit up.

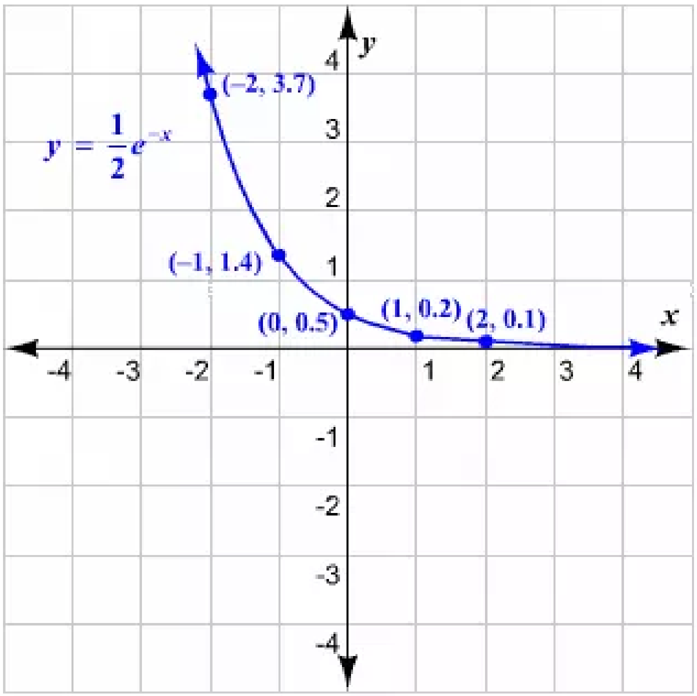
For graphing the function $y = \frac{1}{2}e^{-x}$, first we have to find some points that are solutions of the function. Choose any value for x, say, 1 and find the corresponding value of y.

$$y = \frac{1}{2}e^{-1}$$
$$\approx 0.2$$

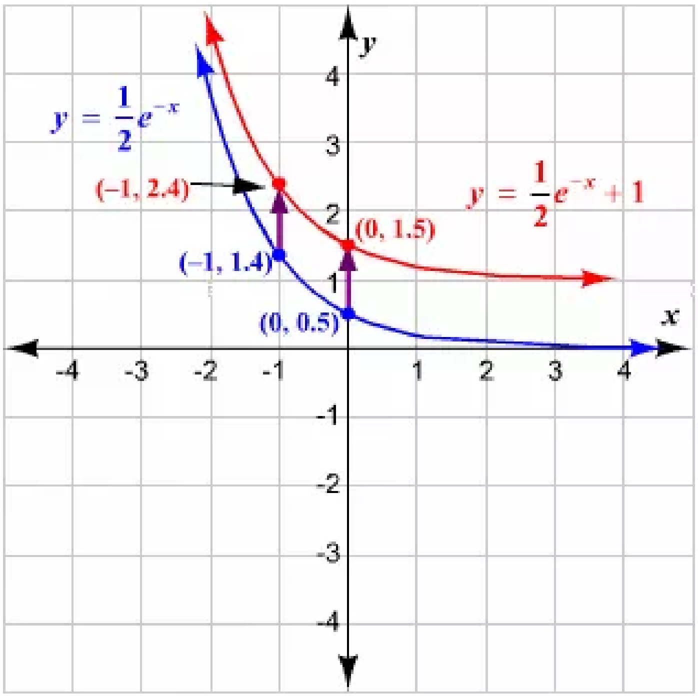
Organize the results in a table.

x	−2	−1	0	1	2
y	3.7	1.4	0.5	0.2	0.1

Now, plot the points on a coordinate plane and connect them with a smooth curve.



Translate the graph of $y = \frac{1}{2}e^{-x}$ one unit up to graph $y = \frac{1}{2}e^{-x} + 1$.



The domain of a function is the set of all input values and the range is the set of all output values.

From the figure, we can find that the input values include all real numbers whereas the output values include only real numbers greater than 1. Therefore, the domain is the set of all real numbers and the range is $y > 1$.

Answer 7q.

Rewrite the expression.

$$\frac{8e^{5x}}{6e^{2x}} = \frac{8}{6}\left(\frac{e^{5x}}{e^{2x}}\right)$$

Simplify the fraction.

$$\frac{8}{6}\left(\frac{e^{5x}}{e^{2x}}\right) = \frac{4}{3}\left(\frac{e^{5x}}{e^{2x}}\right)$$

Apply the quotient of powers property.

$$\frac{4}{3}\left(\frac{e^{5x}}{e^{2x}}\right) = \frac{4}{3}e^{5x-2x}$$

Simplify the exponent.

$$\frac{4}{3}e^{5x-2x} = \frac{4}{3}e^{3x}$$

Thus, the given expression simplifies to $\frac{4}{3}e^{3x}$.

Answer 8e.

Consider the following expression,

$e^x \cdot e^{-3x} \cdot e^4$.

Simplify the above expression as follows:

$$e^x \cdot e^{-3x} \cdot e^4 = e^{x+(-3x)+4} \qquad \text{From the laws of exponents, } a^m a^n = a^{m+n}$$
$$= e^{-2x+4}$$

Therefore, the simplified form of the given expression is $\boxed{e^{-2x+4}}$.

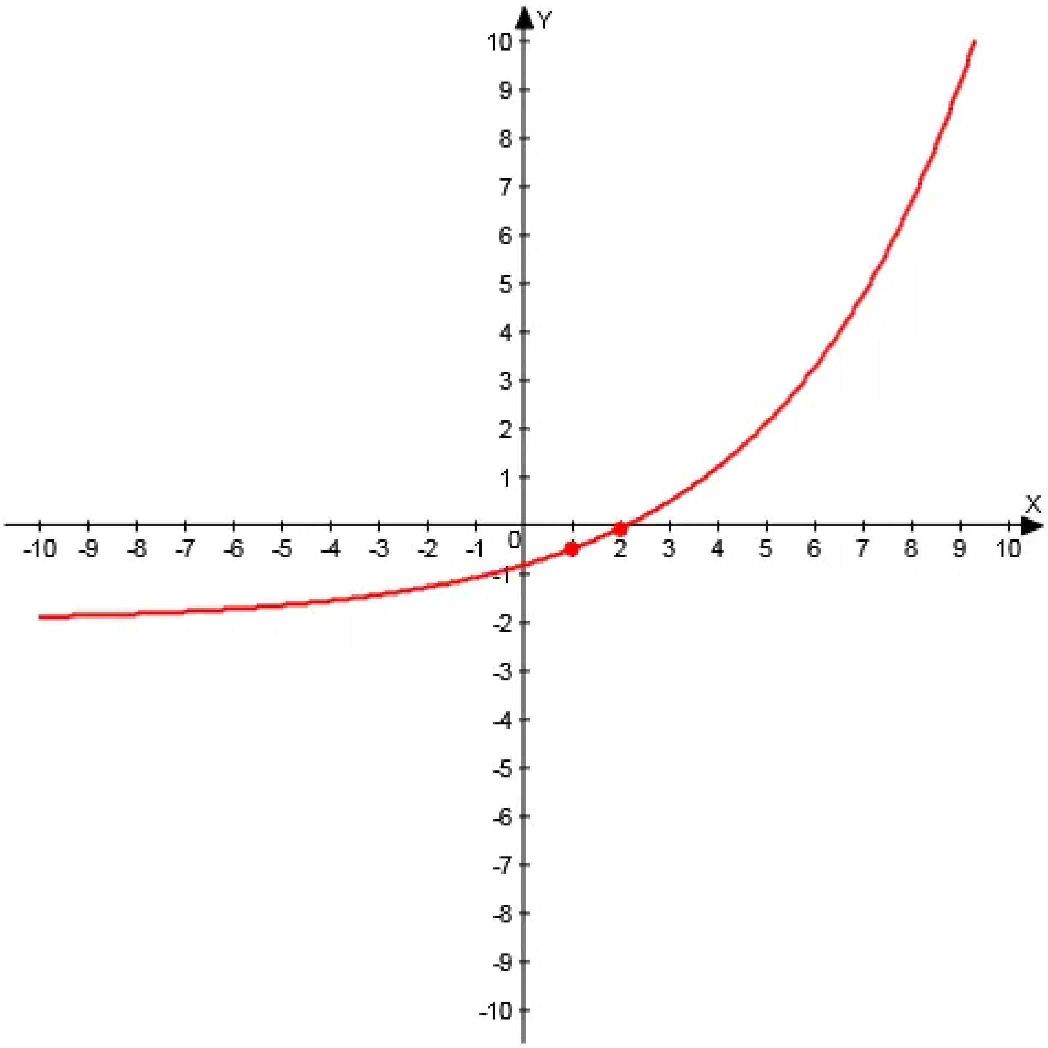
Answer 8gp.

Graphing the natural base function:

$f(x) = 1.5e^{0.25(x-1)} - 2$

The function $f(x) = 1.5e^{0.25(x-1)}$ is in the form $y = ae^{rx}$ where in this case $a = 1.5$ is positive and $r = 0.25$ is positive, the function is an exponential growth function.

Plot the points $(0, 1.5)$ and $(1, 1.92)$, than translate right 1 units and down 2 units to obtain the points $(1, -0.5)$ and $(2, -0.08)$, and draw the curve:



The domain is all real numbers, and the range is $y > -2$.

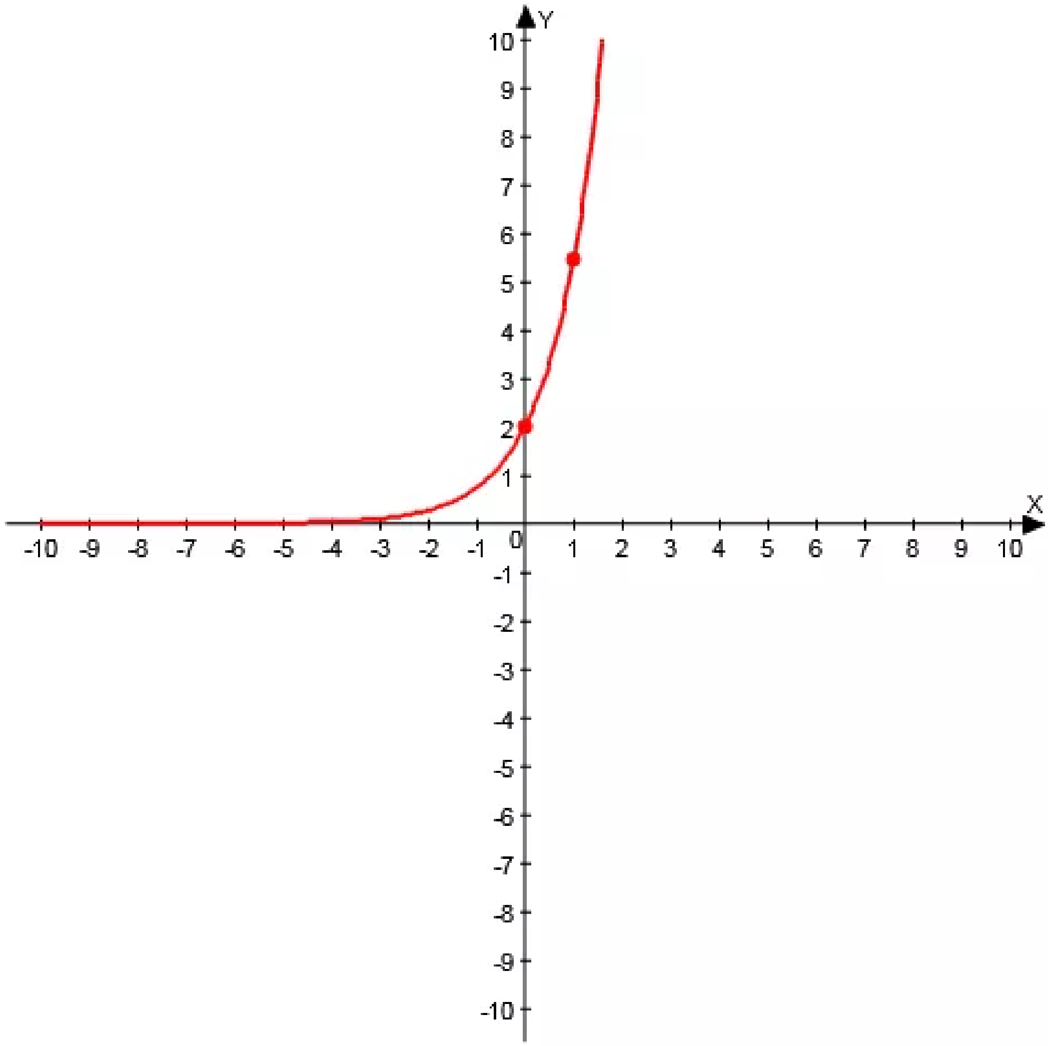
Answer 8q.

Graphing the natural base function:

$y = 2e^x$

The function $y = 2e^x$ is in the form $y = ae^{rx}$ where in this case $a = 2$ is positive and $r = 1$ is positive, the function is an exponential growth function.

Plot the points $(0,2)$ and $(1,5.44)$, and draw the curve:



The domain is all real numbers, and the range is $y > 0$.

Answer 9e.

Use the definition of real *n*th roots of *a*.

$\sqrt{9e^6} = (9e^6)^{1/2}$

Apply the power of a product property.

$$\left(9e^{6}\right)^{1/2} = 9^{1/2}\left(e^{6}\right)^{1/2}$$

Evaluate $9^{1/2}$.

$$9^{1/2}\left(e^{6}\right)^{1/2} = 3\left(e^{6}\right)^{1/2}$$

Apply the power of a power property.

$$3\left(e^{6}\right)^{1/2} = 3e^{6(1/2)}$$

Simplify the exponent.

$$3e^{6(1/2)} = 3e^{3}$$

Thus, the given expression simplifies to $3e^{3}$.

Answer 9gp.

First, substitute 5 for t in the given function.

$$l = 337 - 276e^{-0.178(5)}$$

Now, evaluate using a calculator.

$$l \approx 224$$

Thus, the length of a 5-year old tiger shark is about 224 centimeters.

Answer 9q.

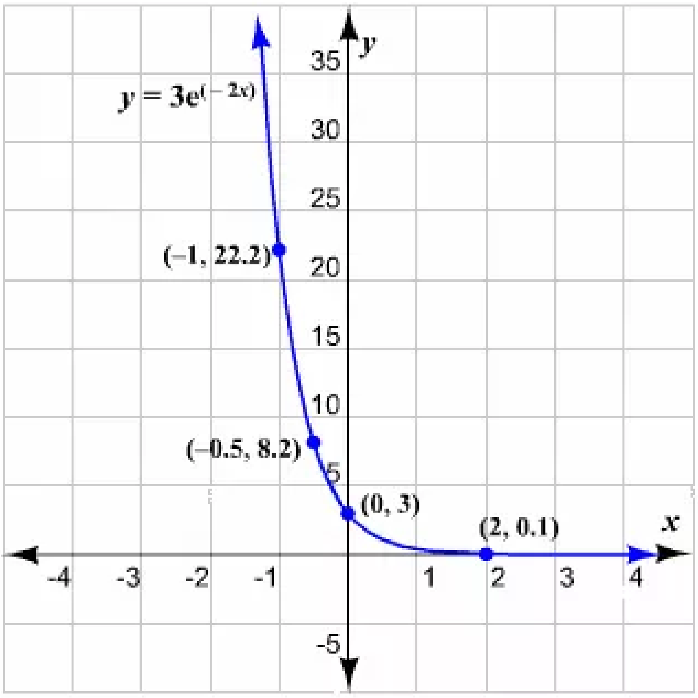
First, we have to find some points on the graph. For this, choose some values for x, say, 0 and find the corresponding values of y.

$$\begin{aligned} y &= 3e^{-2(0)} \\ &= 3 \end{aligned}$$

Organize the results in a table.

x	−1	−0.5	0	2
y	22.2	8.2	3	0.1

Now, plot the points on a coordinate plane and connect them with a smooth curve.



The domain of a function is the set of all input values and the range is the set of all output values.

From the figure, we can find that the input values include all real numbers whereas the output values include only positive real numbers. Therefore, the domain is the set of all real numbers and the range is $y > 0$.

Answer 10e.

Consider the following expression,

$$e^x \cdot 5e^{x+3}.$$

Simplify the above expression as follows:

$e^x \cdot 5e^{x+3} = 5e^{x+(x+3)}$	From the laws of exponents, $a^m a^n = a^{m+n}$
$= 5e^{2x+3}$	Simplify

Therefore, the simplified form of the given expression is $\boxed{5e^{2x+3}}$.

Answer 10gp.

a) We are looking for the balance after 2 years. Here future value is A and principle is P which for this problem is \$2500. Interest rate is 5% or 0.05. The number of year the interest accumulates is $t = 2$.

Substute all the value in the furmula $A = Pe^{rt}$:

$A = 2500e^{0.05 \cdot 2}$	Substitute
$A = 2500e^{0.1}$	Multiply the exponent
$A = 2500 \cdot 1.105$	Apply exponent
$A = 2762.92$	Multiply

Thus the balance after 2 year is $\boxed{\$2762.92}$.

b) We are looking for the balance after 5 years. Here future value is A and principle is P which for this problem is \$2500. Interest rate is 5% or 0.05. The number of year the interest accumulates is $t=5$.

Substute all the value in the furmula $A=Pe^{rt}$:

$A=2500e^{0.05\cdot5}$	Substitute
$A=2500e^{0.25}$	Multiply the exponent
$A=2500\cdot1.28$	Apply exponent
$A=3210.06$	Multiply

Thus the balance after 5 year is $\boxed{\$3210.06}$.

c) We are looking for the balance after 7.5 years. Here future value is A and principle is P which for this problem is \$2500. Interest rate is 5% or 0.05. The number of year the interest accumulates is $t=7.5$.

Substute all the value in the furmula $A=Pe^{rt}$:

$A=2500e^{0.05\cdot7.5}$	Substitute
$A=2500e^{0.375}$	Multiply the exponent
$A=2500\cdot1.455$	Apply exponent
$A=3637.48$	Multiply

Thus the balance after 7.5 year is $\boxed{\$3637.48}$.

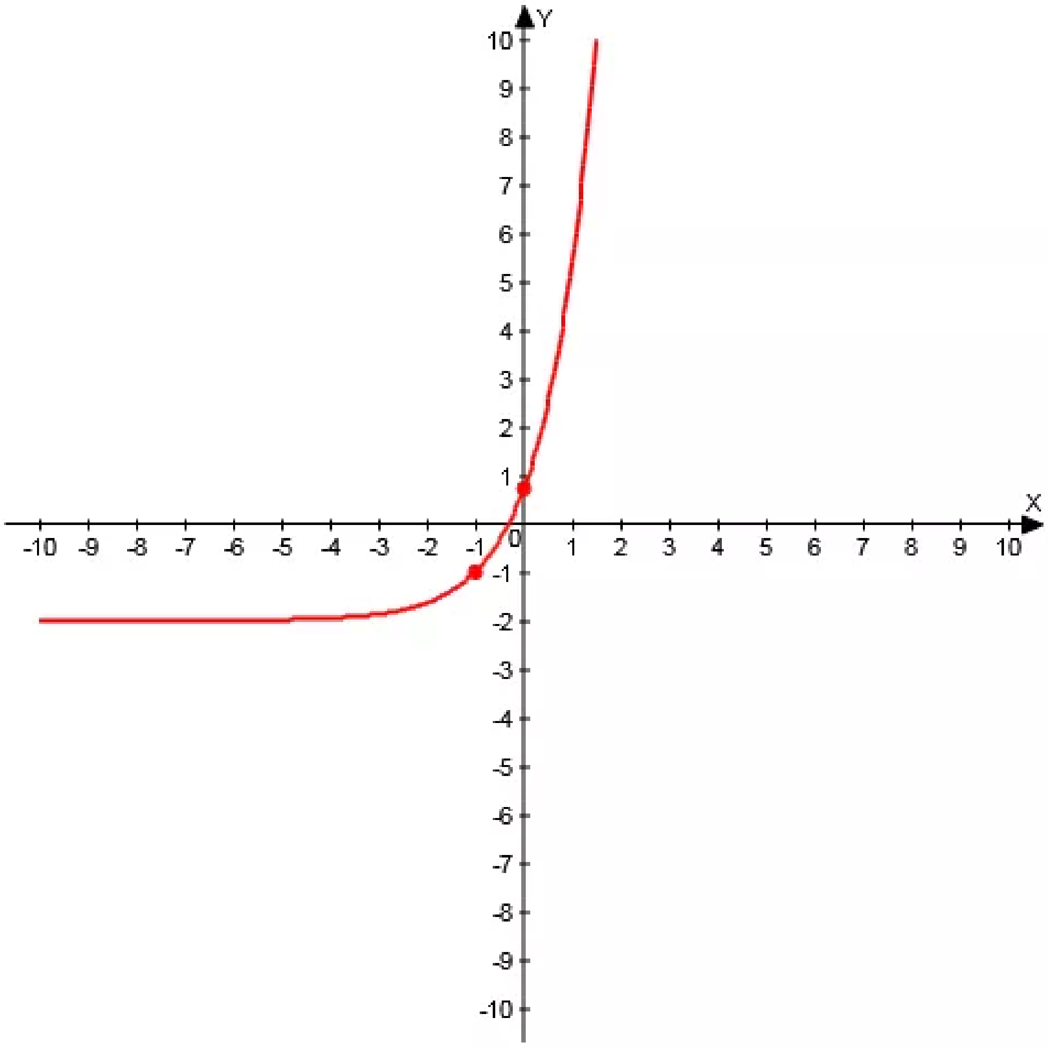
Answer 10q.

Graphing the natural base function:

$f(x)=e^{x+1}-2$

The function $f(x)=e^{x+1}$ is in the form $y=ae^{rx}$ where in this case $a=1$ is positive and $r=1$ is positive, the function is an exponential growth function.

Plot the points $(0,1)$ and $(1,2.72)$, than translate left 1 units and down 2 units to obtain the points $(-1,-1)$and $(0,0.72)$, and draw the curve:



The domain is all real numbers, and the range is $y > -2$.

Answer 11e.

Apply the quotient of powers property.

$$\frac{3e}{e^x} = 3e^{1-x}$$

Thus, the given expression simplifies to $3e^{1-x}$.

Answer 11gp.

Consider $t = 2$. In order to find the amount of interest earned in 2 years, first we have to find the balance at the end of 2 years.
For this, substitute 2500 for P, 0.05 for r, and 2 for t in the formula $A = Pe^{rt}$.

$$A = 2500e^{0.05(2)}$$

Use a calculator to evaluate.

$$A \approx 2762.93$$

The balance at the end of 2 years is about \$2762.93.

Now, subtract the principal amount from the balance at the end of 2 years.
$2762.93 - 2500 = 262.93$

Thus, the amount of interest earned in 2 years is about \$262.93.

Similarly, repeat the procedure for $t = 5$ and $t = 6.5$.
The amount of interest earned in 5 years is about \$710.06 and in 7.5 years is about \$1137.48.

Answer 11q.

The graph of the function $g(x) = 4e^{-3x} + 1$ is obtained by translating the graph of $g(x) = 4e^{-3x}$ one unit up.

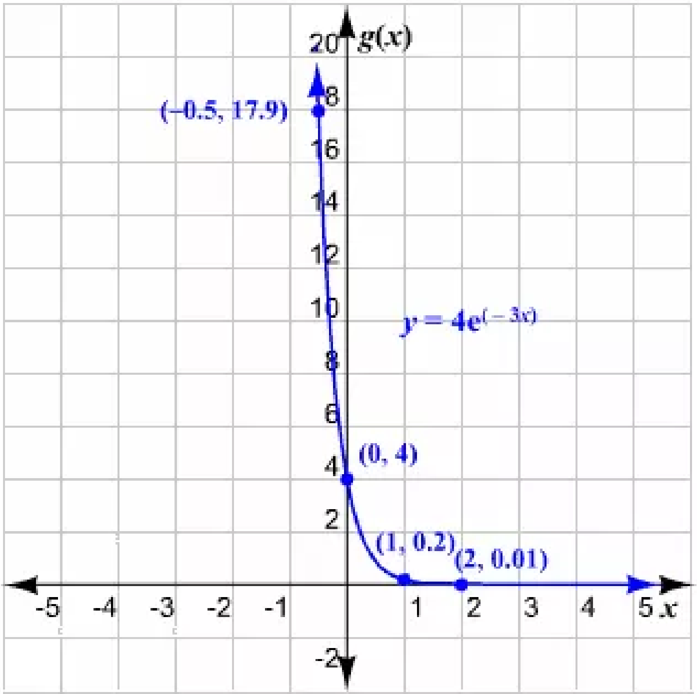
For graphing the function $g(x) = 4e^{-3x}$, first we have to find some points on the graph. Choose some values for x, say, 1 and find the corresponding values of y.

$$y = 4e^{-3(1)}$$
$$\approx 0.2$$

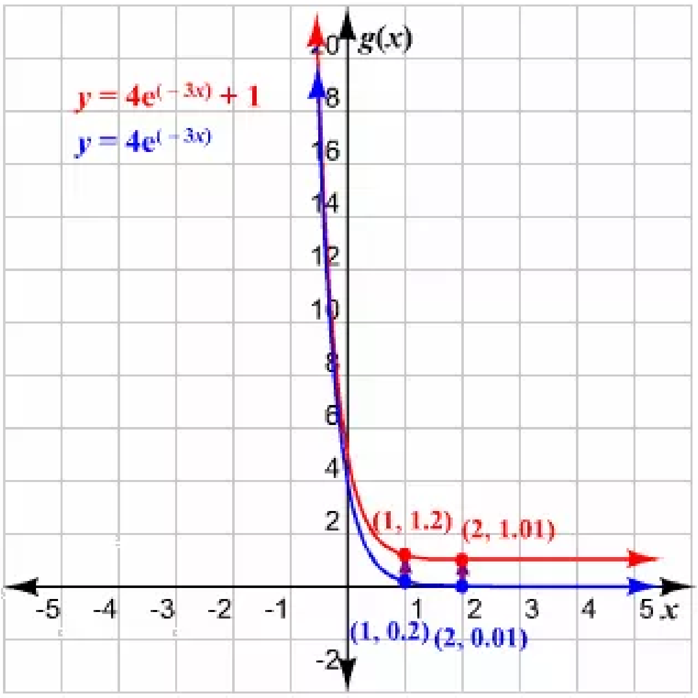
Organize the results in a table.

x	−0.5	0	1	2
y	17.9	4	0.2	0.01

Now, plot the points on a coordinate plane and connect them with a smooth curve.



Translate the graph of $g(x) = 4e^{-3x}$ one unit up to graph $g(x) = 4e^{-3x} + 1$.



The domain of a function is the set of all input values and the range is the set of all output values.

From the figure, we can find that the input values include all real numbers whereas the output values include only real numbers greater than 0. Therefore, the domain is the set of all real numbers and the range is $y > 0$.

Answer 12e.

Consider the following expression,

$$\frac{4e^x}{e^{4x}}.$$

Simplify the above expression as follows:

$$\frac{4e^x}{e^{4x}} = 4e^{x-4x} \quad \text{From the laws of exponents, } \frac{a^m}{a^n} = a^{m-n}$$

$$= 4e^{-3x} \quad \text{Simplify}$$

$$= \frac{4}{e^{3x}} \quad \text{From the laws of exponents, } \left(a^{-m}\right) = \frac{1}{a^m}$$

Therefore, the simplified form of the given expression is $\boxed{\frac{4}{e^{3x}}}$.

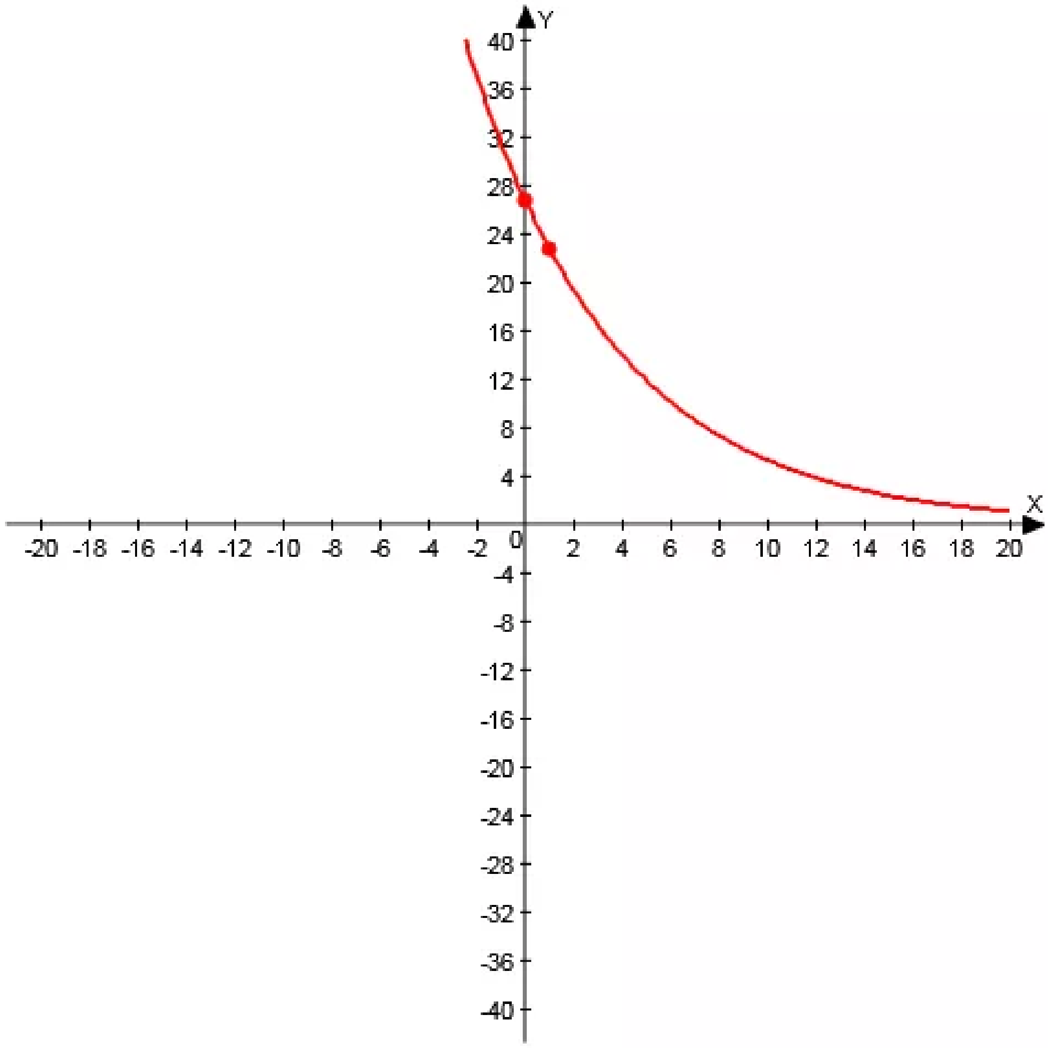
Answer 12q.

From 1997 to 2001, the number n (in million) of black-and-white TVs sold in the United States can be modeled by $n = 26.8(0.85)^t$ where t is the number of years since 1997.

The decay factor is $\boxed{0.85}$, which means that the present decrease is $1 - 0.85 = 0.15 = \boxed{15\%}$.

Graphing the function:

The function $n = 26.8(0.85)^t$ is an exponential decay function, and goes through the points $(0, 26.8)$ and $(1, 22.78)$.



The domain is all real numbers, and the range is $y > 0$,

Substitute $1999 - 1997 = 2$ for t to find the number of TVs.

$n = 26.8(0.85)^t$

$n = 26.8(0.85)^2$

$n = 26.8 \cdot 0.7225$

$n = 19.363$

Thus in 1999, the number of black-and-white TVs sold was approximately $\boxed{19}$.

Answer 13e.

Let $a^{1/n}$ be an nth root of a, and let m be a positive integer. Then,

$a^{m/n} = \left(a^{1/n}\right)^m = \left(\sqrt[n]{a}\right)^m$.

Thus,

$\sqrt[3]{8e^{9x}} = \left(8e^{9x}\right)^{1/3}$

Apply the power of a product property.

$\left(8e^{9x}\right)^{1/3} = 8^{1/3}\left(e^{9x}\right)^{1/3}$

Evaluate $8^{1/3}$.

$8^{1/3}\left(e^{9x}\right)^{1/3} = 2\left(e^{9x}\right)^{1/3}$

Apply the power of a power property.

$2\left(e^{9x}\right)^{1/3} = 2e^{9x(1/3)}$

Simplify the exponent.

$2e^{9x(1/3)} = 2e^{3x}$

Therefore, the given expression simplifies to $2e^{3x}$.

Answer 13q.

The amount A in an account after t years for a continuously compounded interest is given by the formula $A = Pe^{rt}$ where P is the principal, and r is the annual interest rate expressed as a decimal.

In this case, the principal is \$1200, annual interest expressed in decimal is 0.045, and the time is 5 years.

First, substitute 1200 for P, 0.045 for r, and 5 for t in the formula.

$A = 1200e^{0.045(5)}$

Now, evaluate using a calculator.

$A \approx 1502.79$

The balance after 5 years is about \$1502.79.

Answer 14e.

Consider the following expression,

$$\frac{6e^{4x}}{8e}.$$

Simplify the above expression as follows:

$$\frac{6e^{4x}}{8e} = \frac{6}{8}\cdot\frac{e^{4x}}{e}$$

From the laws of exponents, $\frac{a^m}{a^n} = a^{m-n}$

$$= \frac{3}{4}\cdot e^{4x-1}$$

Simplify

$$= \frac{3}{4}e^{4x-1}$$

Therefore, the simplified form of the given expression is $\boxed{\frac{3e^{4x-1}}{4}}$.

Answer 15e.

Apply the power of a product property.

$$\left(4e^{2x}\right)^3 = 4^3\left(e^{2x}\right)^3$$

Evaluate 4^3.

$$4^3\left(e^{2x}\right)^3 = 64\left(e^{2x}\right)^3$$

Apply the power of a power property.

$$64\left(e^{2x}\right)^3 = 64e^{2x\cdot 3}$$

Simplify the exponent.

$$64e^{2x\cdot 3} = 64e^{6x}$$

Therefore, the given expression simplifies to $64e^{6x}$. The correct answer is choice **C**.

Answer 16e.

Consider the following expression,

$$\sqrt{\frac{4\left(27e^{13}x\right)}{3e^7x^{-3}}}.$$

Simplify the above expression as follows:

$$\sqrt{\frac{4\left(27e^{13}x\right)}{3e^7x^{-3}}} = \sqrt{\frac{108e^{13}x}{3e^7x^{-3}}}$$

Multiply and simplify

$$= \sqrt{\frac{108}{3}\cdot\frac{e^{13}}{e^7}\cdot\frac{x}{x^{-3}}}$$

$$= \sqrt{36e^{13-7}x^{1-(-3)}}$$

From the laws of exponents, $\frac{a^m}{a^n} = a^{m-n}$

$$= \sqrt{36e^6x^4}$$

Simplify

$$= 6e^3x^2$$

Use the square property

Therefore, the simplified form of the given expression is $\boxed{6e^3x^2}$.

Thus, the solution matches with $\boxed{D}$.

Answer 17e.

The power of a product property states that for any real numbers a, b, and m, $(ab)^m = a^m b^m$.

When evaluating the power of a product, each term in the product must be raised to the power. Thus, the error is that the 3 is not raised to the second power.

In order to correct the error, first apply the power of a product property.

$$\left(3e^{5x}\right)^2 = 3^2\left(e^{5x}\right)^2$$

Evaluate 3^2.

$$3^2\left(e^{5x}\right)^2 = 9\left(e^{5x}\right)^2$$

Apply the power of a power property.

$$9\left(e^{5x}\right)^2 = 9e^{5x\cdot 2}$$

Simplify the exponent.

$$9e^{5x\cdot 2} = 9e^{10x}$$

Therefore, the given expression simplifies to $9e^{10x}$.

Answer 18e.

Consider the following solution:

$$\frac{e^{6x}}{e^{-2x}} = e^{6x-2x}$$
$$= e^{4x}$$

In the above solution the error is that a negative sign was left out in the first step.
The correct solution is,

$$\frac{e^{6x}}{e^{-2x}} = e^{6x-(-2x)}$$
$$= e^{6x+2x}$$
$$= e^{8x}$$

Answer 19e.

First, you have to press the [2nd] key on a calculator. Then, press the [e^x] key and enter 3 in the calculator. Now, press the [)] key.

Finally, press the [ENTER] key to get the result.

The display is 20.08553692. This result might vary slightly depending on the calculator you use.

Round the result to the nearest thousandth.
$20.08553692 \approx 20.086$

Thus, the value of e^3 is about 20.086.

Answer 20e.

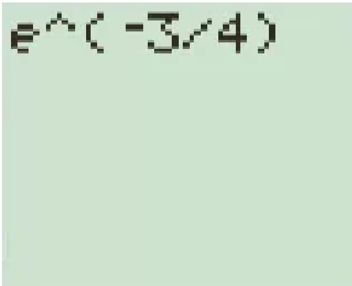
Consider the following expression,

$$e^{-3/4}.$$

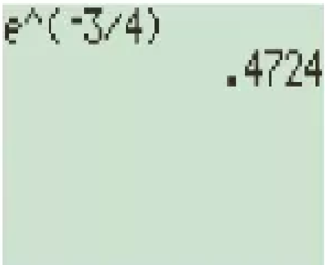
Use the calculator to evaluate the above expression as follows:
Input the expression $e^{-3/4}$ into the calculator by pressing the following keys,

$$\boxed{\text{2nd}}\ \boxed{\ln}\ \boxed{(-)}\ \boxed{3}\ \boxed{\div}\ \boxed{4}\ \boxed{)}.$$

Then it will be displayed as shown below.



Finally press $\boxed{\text{ENTER}}$ to get the result. Then it will be displayed as shown below.



Therefore, the value of the expression $e^{-3/4}$ is $\boxed{0.472}$.

Answer 21e.

First, you have to press the $\boxed{\text{2nd}}$ key on a calculator. Then, press the $\boxed{e^x}$ key and enter 2.2 in the calculator. Now, press the $\boxed{)}$ key.

Finally, press the $\boxed{\text{ENTER}}$ key to get the result.

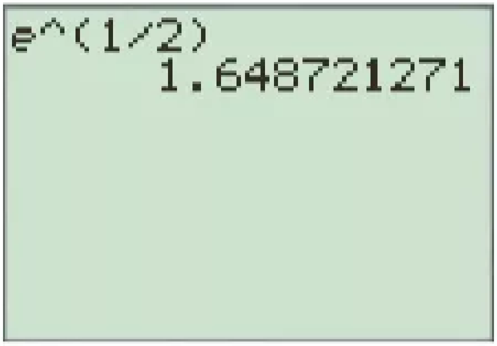
The display is 9.025013499. This result might vary slightly depending on the calculator you use.

Round the result to the nearest thousandth.
9.025013499 ≈ 9.025

Thus, the value of $e^{2.2}$ is about 9.025.

Answer 22e.

Consider the expression $e^{\frac{1}{2}}$
Using the TI-83 calculator



The key strokes which are used in TI-83 calculator are

Thus the answer is $\boxed{1.649}$.

Answer 23e.

First, you have to press the $\boxed{\text{2nd}}$ key on a calculator. Then, press the $\boxed{e^x}$ key.
Next, press the key $\boxed{(}$, press the key $\boxed{(-)}$ followed by the number 2, $\boxed{\div}$, 5, and $\boxed{)}$ keys.

Finally, press the $\boxed{\text{ENTER}}$ key to get the result.

The display is 9.025013499. This result might vary slightly depending on the calculator you use.

Finally, press the $\boxed{\text{ENTER}}$ key to get the result.

The display is 0.670320046. This result might vary slightly depending on the calculator you use.

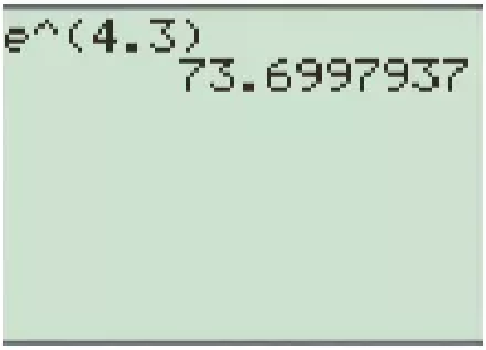
Round the result to the nearest thousandth.
0.670320046 ≈ 0.670

Thus, the value of $e^{-2/5}$ is about 0.670.

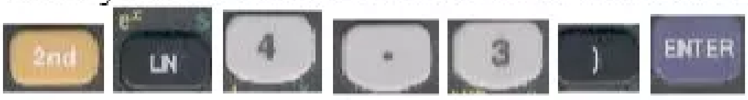
Answer 24e.

Consider the expression $e^{4.3}$

Using the TI-83 calculator



The key strokes which are used in TI-83 calculator are



Thus the answer is $\boxed{73.7}$.

Answer 25e.

First, you have to press the $\boxed{\text{2nd}}$ key on a calculator. Then, press the $\boxed{e^x}$ key and enter 7 in the calculator. Now, press the $\boxed{)}$ key.

Finally, press the $\boxed{\text{ENTER}}$ key to get the result.

The display is 1096.633158. This result might vary slightly depending on the calculator you use.

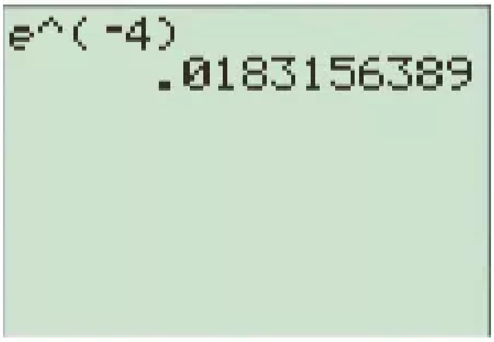
Round the result to the nearest thousandth.

$1096.633158 \approx 1096.633$

Thus, the value of e^7 is about 1096.633.

Answer 26e.

Consider the expression e^{-4}
Using the TI-83 calculator



The key strokes which are used in TI-83 calculator are

Thus the answer is $\boxed{0.0183}$.

Answer 27e.

First, you have to enter 2 in the calculator. Then, press the $\boxed{\text{2nd}}$ key and the $\boxed{e^x}$ key.

Now, press the $\boxed{(-)}$ key followed by the number 0.3 and $\boxed{)}$ key.

Finally, press the $\boxed{\text{ENTER}}$ key to get the result.

The display is 1.481636441. This result might vary slightly depending on the calculator you use.

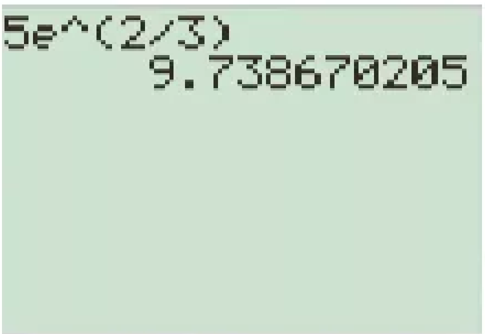
Round the result to the nearest thousandth.
$1.481636441 \approx 1.482$

Thus, the value of $e^{-0.3}$ is about 1.482.

Answer 28e.

Consider the expression $5e^{2/3}$

Using the TI-83 calculator



The key strokes which are used in TI-83 calculator are

Thus the answer is $\boxed{9.739}$.

Answer 29e.

First, you have to press the $\boxed{(-)}$ key followed by the number 6 on the calculator. Then, press the $\boxed{\text{2nd}}$ key and the $\boxed{e^x}$ key. Now, enter 2.4 and press the $\boxed{)}$ key.

Finally, press the $\boxed{\text{ENTER}}$ key to get the result.

The display is -66.13905828. This result might vary slightly depending on the calculator you use.

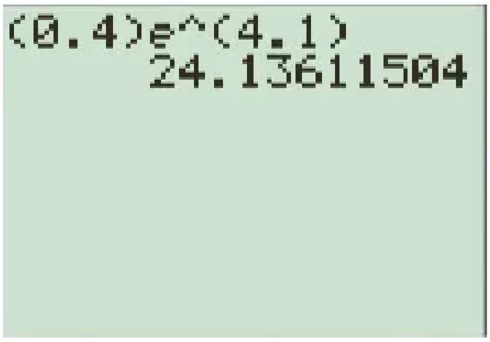
Round the result to the nearest thousandth.

$-66.13905828 \approx -66.139$

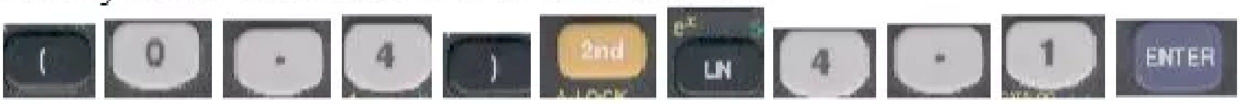
Thus, the value of $-6e^{2.4}$ is about -66.139.

Answer 30e.

Consider the expression $0.4e^{4.1}$
Using TI-83 Calculator



The key strokes which are used in TI-83 calculator are



Thus the answer is $\boxed{24.136}$.

Answer 31e.

A natural base exponential function is of the form $y = ae^{rx}$, where $a > 0$. This function is called an exponential growth if $r > 0$ and an exponential decay if $r < 0$.

On comparing the given function with the general form, we find that $a = 3$, and $r = -1$.
Since $r < 0$, $f(x) = 3e^{-x}$ is an exponential decay function.

Answer 32e.

Consider the function $f(x) = \frac{1}{3}e^{4x}$

A function of the form $y = ae^{rx}$ is called a natural base exponential function.

- If $a > 0$ and $r > 0$, the function is an exponential growth function.
- If $a > 0$ and $r < 0$, the function is an exponential decay function.

The given function $f(x) = \frac{1}{3}e^{4x}$ is an $\boxed{\text{exponential growth}}$ function because $a = \frac{1}{3}$ is positive and $r = 4$ is positive.

Answer 33e.

A natural base exponential function is of the form $y = ae^{rx}$, where $a > 0$. This function is called an exponential growth if $r > 0$ and an exponential decay if $r < 0$.

On comparing the given function with the general form, we find that $a = 1$, and $r = -4$. Since $r < 0, f(x) = e^{-4x}$ is an exponential decay function.

Answer 34e.

Consider the function $f(x) = \frac{3}{5}e^{x}$

A function of the form $y = ae^{rx}$ is called a natural base exponential function.

- If $a > 0$ and $r > 0$, the function is an exponential growth function.
- If $a > 0$ and $r < 0$, the function is an exponential decay function.

The given function $f(x) = \frac{3}{5}e^{x}$ is an $\boxed{\text{exponential growth}}$ function because $a = \frac{3}{5}$ is positive and $r = 1$ is positive.

Answer 35e.

A natural base exponential function is of the form $y = ae^{rx}$, where $a > 0$. This function is called an exponential growth if $r > 0$ and an exponential decay if $r < 0$.

On comparing the given function with the general form, we find that $a = \frac{1}{4}$, and $r = -5$.

Since $r < 0$, $f(x) = \frac{1}{4}e^{-5x}$ is an exponential decay function.

Answer 36e.

Consider the function $f(x) = e^{3x}$

A function of the form $y = ae^{rx}$ is called a natural base exponential function.

- If $a > 0$ and $r > 0$, the function is an exponential growth function.
- If $a > 0$ and $r < 0$, the function is an exponential decay function.

The given function $f(x) = e^{3x}$ is an $\boxed{\text{exponential growth}}$ function because $a = 1$ is positive and $r = 3$ is positive.

Answer 37e.

A natural base exponential function is of the form $y = ae^{rx}$, where $a > 0$. This function is called an exponential growth if $r > 0$ and an exponential decay if $r < 0$.

On comparing the given function with the general form, we find that $a = 2$, and $r = 4$. Since $r > 0, f(x) = 4e^{-2x}$ is an exponential growth function.

Answer 38e.

Consider the function $f(x) = 4e^{-2x}$

A function of the form $y = ae^{rx}$ is called a natural base exponential function.

- If $a > 0$ and $r > 0$, the function is an exponential growth function.
- If $a > 0$ and $r < 0$, the function is an exponential decay function.

The given function $f(x) = 4e^{-2x}$ is an exponential decay function because $a = 4$ is positive and $r = -2$ is negative.

Answer 39e.

Find the y-intercept of the given function. For this, substitute 0 for x in the function and evaluate y.

$$\begin{aligned} y &= 0.5e^{0.5(0)} \\ &= 0.5e^{0} \\ &= 0.5 \end{aligned}$$

Thus, the graph of the function touches the y-axis at (0, 0.5).

Among the given choices, graph **B** has the y-intercept as (0, 0.5). Therefore, the correct answer is choice **B**.

Answer 40e.

Consider the function $y = 2e^{0.5x}$

Graphing the natural base function:

$y = 2e^{0.5x}$

The function $y = 2e^{0.5x}$ is in the form $y = ae^{rx}$ where in this case $a = 2$ is positive and $r = 2.5$ is positive, the function is an exponential growth function.

If we substitute $x = 0$ in the given function $y = 2e^{0.5x}$

Then

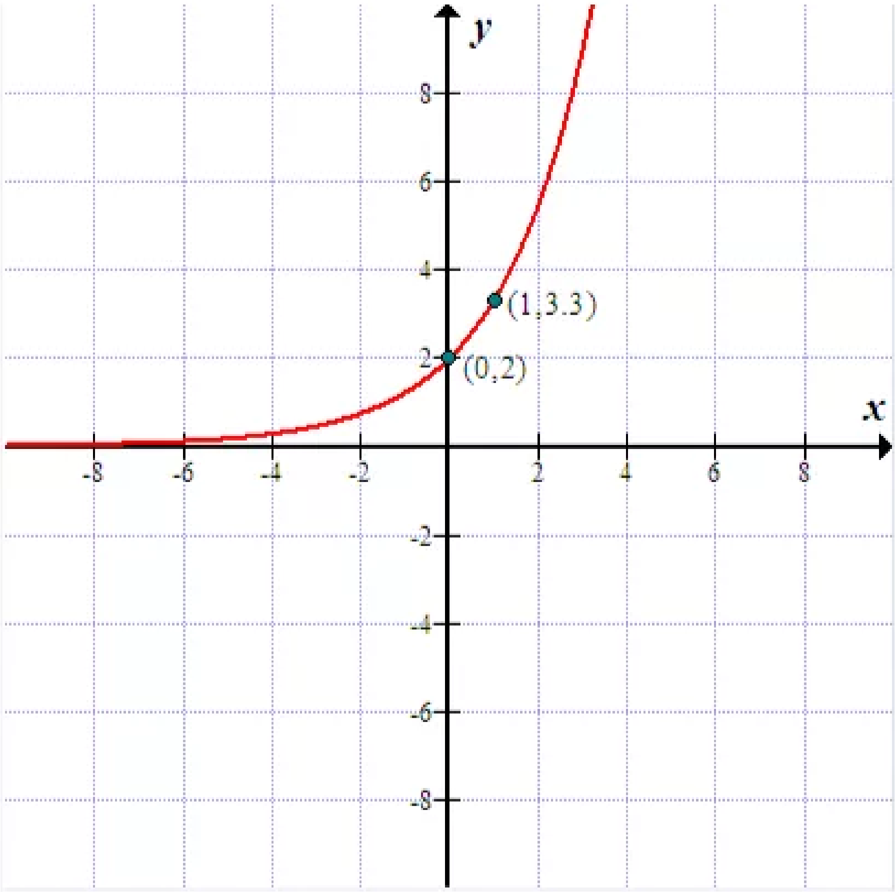
$$\begin{aligned} y &= 2e^{(0.5)(0)} \\ &= 2e^{0} \\ &= 2 \end{aligned}$$

If we substitute $x = 1$ in the given function $y = 2e^{0.5x}$

Then

$$\begin{aligned} y &= 2e^{(0.5)(1)} \\ &= 2e^{0.5} \\ &= 2(1.648721) \\ &= 3.3 \end{aligned}$$

Plot the points $(0,2)$ and $(1,3.3)$, and draw the curve:



The domain is all real numbers, and the range is $y > 0$.

Thus the correct option is $\boxed{\text{C}}$

Answer 41e.

Find the y-intercept of the given function. For this, substitute 0 for x in the function and evaluate y.

$$\begin{aligned} y &= e^{0.5(0)} + 2 \\ &= e^{0} + 2 \\ &= 1 + 2 \\ &= 3 \end{aligned}$$

Thus, the graph of the function touches the y-axis at (0, 3).

Among the given choices, graph **A** has the y-intercept as (0, 3). Therefore, the correct answer is choice **A**.

Answer 42e.

Graphing the natural base function $y = e^{-2x}$

The function $y = e^{-2x}$ is in the form $y = ae^{rx}$

Where in this case $a = 1$ is positive and $r = -2$ is negative

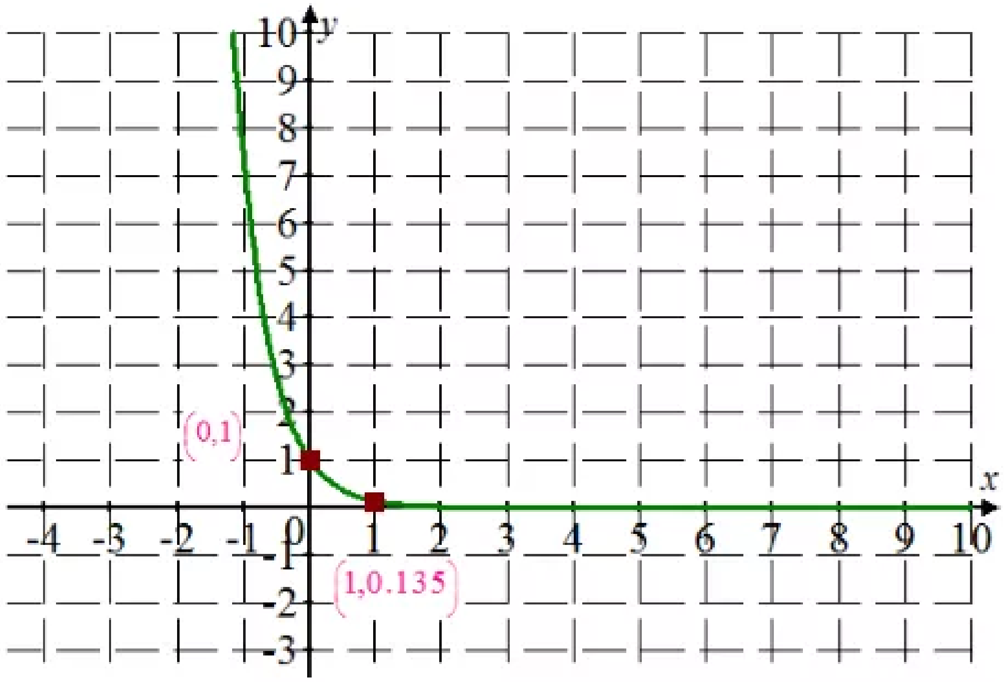
The function is an exponential decay function.

On substituting the values in the given function get the corresponding points

Where it intersects

Let 0, 1 be the point in given function then values are given below

Plot the points $(0,1)$ and $(1,0.135)$, and draw the curve:



The domain is $\boxed{\text{all real numbers}}$ and the range is $\boxed{y>0}$.

Answer 43e.

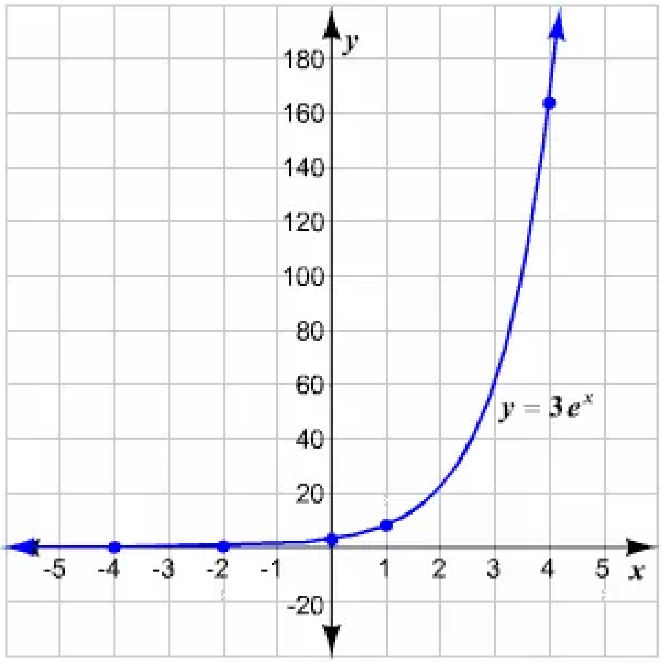
First, we have to find some points that are solutions of the function. For this, choose any value for x, say -4, and find the corresponding value of y.

$$y = 3e^{-4}$$
$$\approx 0.05$$

Organize the results in a table.

x	-4	-2	0	1	4
y	0.05	0.4	3	8.2	163.8

Now, plot the points on a coordinate plane and connect them with a smooth curve.



The domain of a function is the set of all input values and the range is the set of all output values.

From the figure, we can find that the input values include all real numbers whereas the output values include only positive real numbers. Therefore, the domain is the set of all real numbers and the range is $y > 0$.

Answer 44e.

Graphing the natural base function $y = 0.5e^x$

The function $y = 0.5e^x$ is in the form $y = ae^{rx}$

where in this case $a = 0.5$ is positive and $r = 1$ is positive

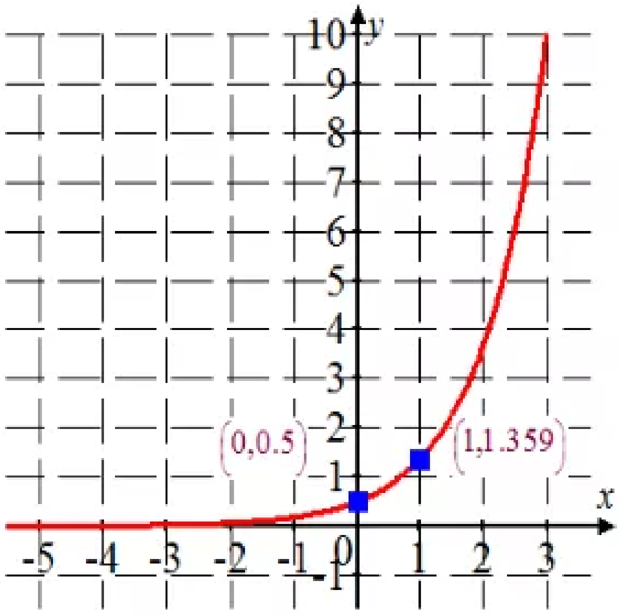
the function is an exponential growth function.

On substituting the values in the given function get the corresponding points

Where it intersects

Let 0, 1 be the point in given function then values are given below

Plot the points $(0, 0.5)$ and $(1, 1.359)$ draw the curve:



The domain is all real numbers and the range is $y > 0$.

Answer 45e.

The graph of the function $y = 2e^{-3x} - 1$ is obtained by translating the graph of $y = 2e^{-3x}$ one unit down.

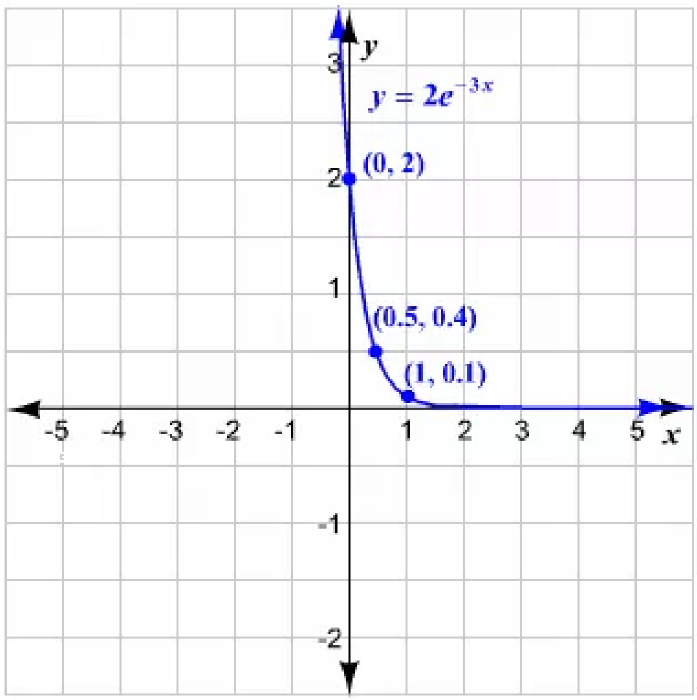
For graphing the function $y = 2e^{-3x}$, first we have to find some points that are solutions of the function. Choose any value for x, say 1, and find the corresponding value of y.

$$y = 2e^{-3(1)}$$
$$\approx 0.0996$$

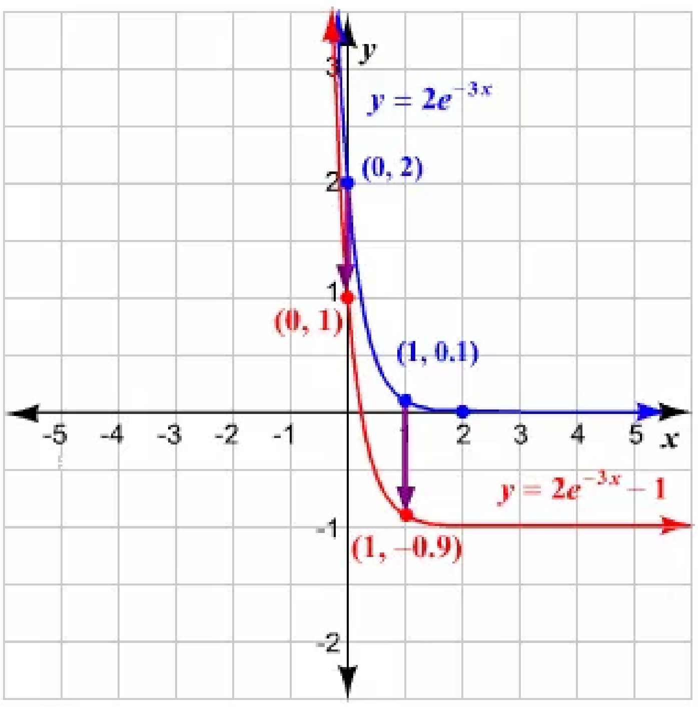
Organize the results in a table.

x	0	0.5	1
y	2	0.4	0.1

Now, plot the points on a coordinate plane and connect them with a smooth curve.



Translate the graph of $y = 2e^{-3x}$ one unit down to graph $y = 2e^{-3x} - 1$.



The domain of a function is the set of all input values and the range is the set of all output values.

From the figure, we can find that the input values include all real numbers whereas the output values include only real numbers greater than -1. Therefore, the domain is the set of all real numbers and the range is $y > -1$.

Answer 46e.

Graphing the natural base function $y = 2.5e^{-2.5x} + 2$

The function $y = 2.5e^{-2.5x}$ is in the form $y = ae^{rx}$

Where in this case $a = 2.5$ is positive and $r = -0.5$ is negative

The function is an exponential decay function.

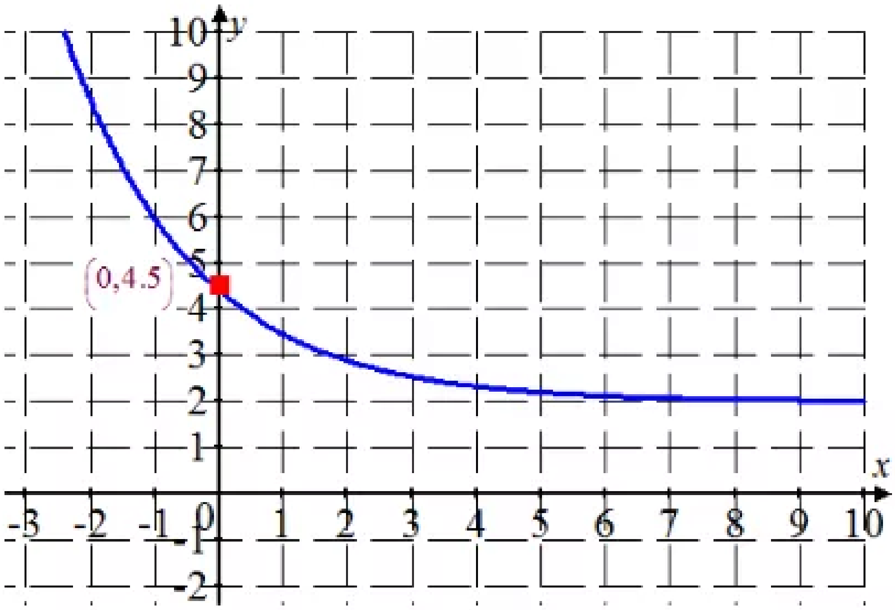
On substituting the values in the given function get the corresponding points

Where it intersects

Let 0, 1 be the point in given function then values are given below

Plot the points $(0, 2.5)$ and $(1, 0.205)$

Than translate up 2 point to obtain the points $(0, 4.5)$ and $(1, 2.205)$; draw the curve:



The domain is all real numbers, and the range is $y > 2$

Answer 47e.

The graph of the function $y = 0.6e^{x-2}$ is obtained by translating the graph of $y = 0.6e^{x}$ two units to the right.

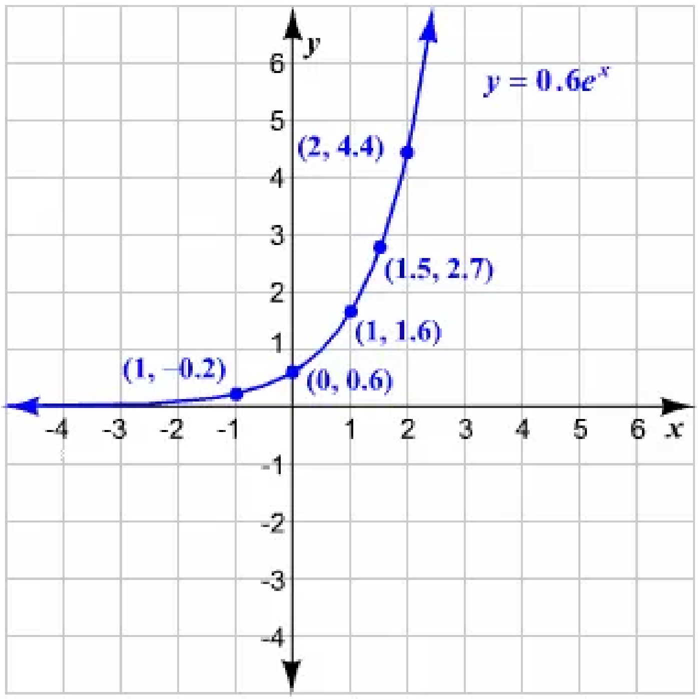
For graphing the function $y = 0.6e^{x}$, first we have to find some points that are solutions of the function. Choose any value for x, say 1, and find the corresponding value of y.

$$y = 0.6e^{-1}$$
$$\approx 1.63$$

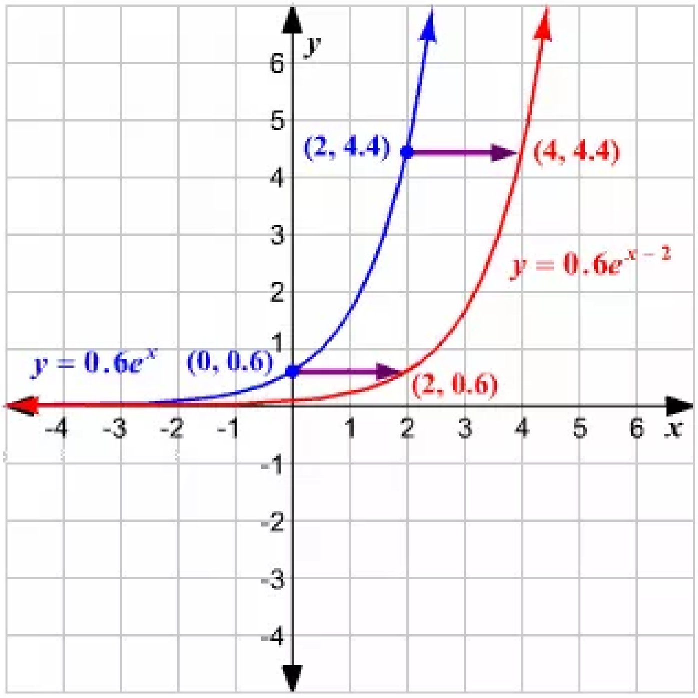
Organize the results in a table.

x	−1	0	1	1.5	2
y	0.2	0.6	1.6	2.7	4.4

Now, plot the points on a coordinate plane and connect them with a smooth curve.



Translate the graph of $y = 0.6e^x$ two units right to graph $y = 0.6e^{x-2}$.



The domain of a function is the set of all input values and the range is the set of all output values.

From the figure, we can find that the input values include all real numbers whereas the output values include only positive real numbers. Therefore, the domain is the set of all real numbers and the range is $y > 0$.

Answer 48e.

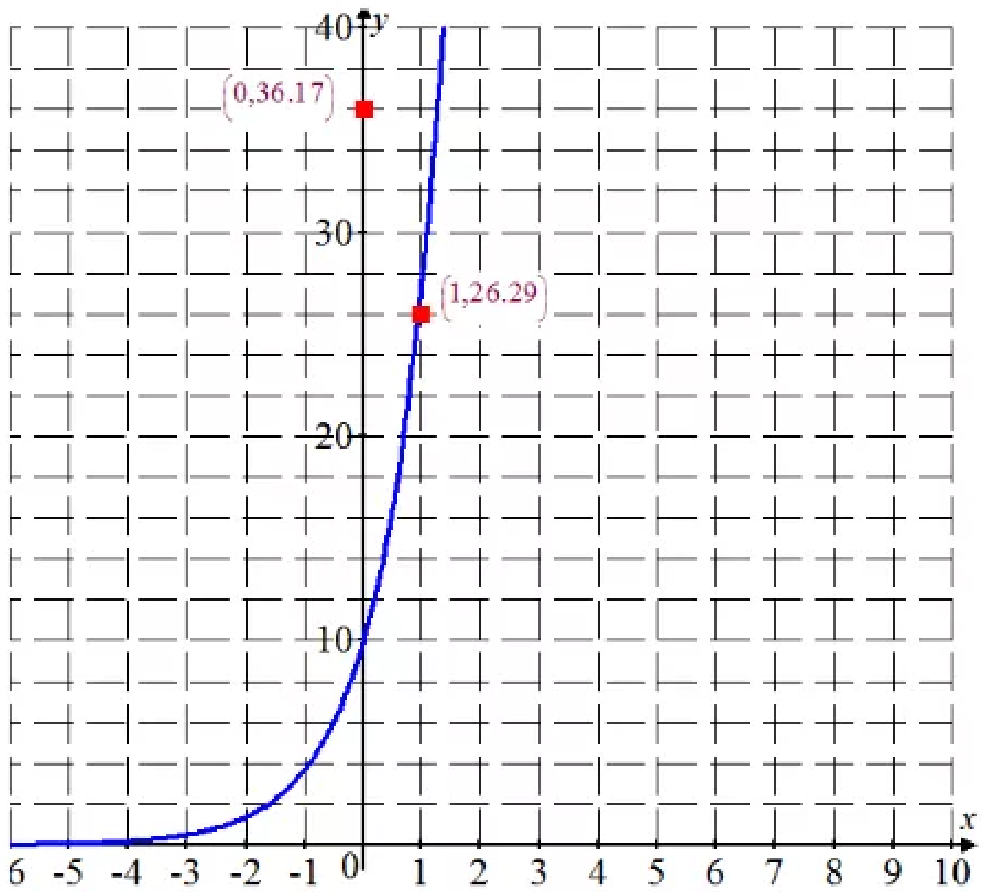
Graphing the natural base function $f(x) = \frac{1}{2}e^{x+3} - 2$

The function $f(x) = \frac{1}{2}e^{x+3}$ is in the form $y = ae^{rx}$

Where in this case $a = 0.5$ is positive and $r = 1$ is positive
The function is an exponential growth function.
On substituting the values in the given function get the corresponding points
Where it intersects

Let 0, 1 be the point in given function then values are given below

Plot the points $(0,36.17)$ and $(1,26.29)$; draw the curve:



The domain is all real numbers and the range is $y > 10$

Answer 49e.

The graph of the function $g(x) = \frac{4}{3}e^{x-1} + 1$ is obtained by translating the graph of $g(x) = \frac{4}{3}e^{x}$ one unit to the right and one unit up.

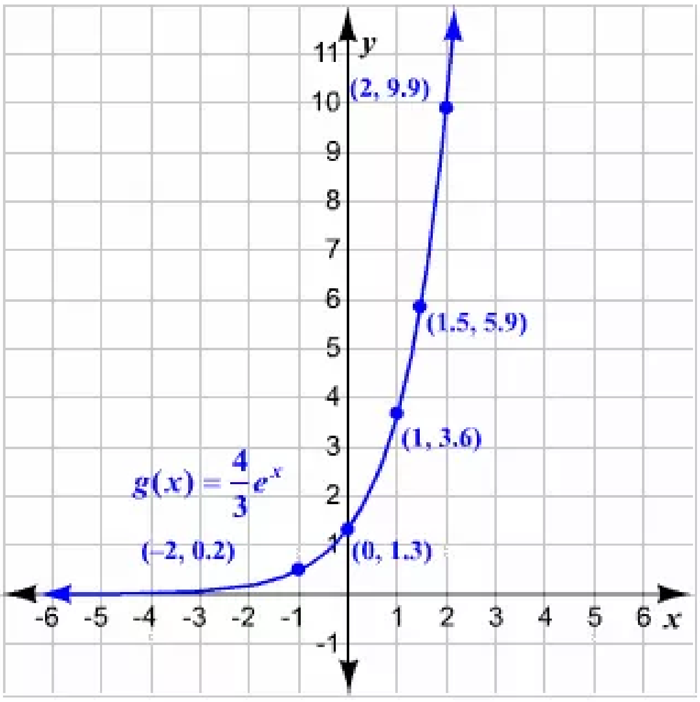
For graphing the function $g(x) = \frac{4}{3}e^{x}$, first we have to find some points that are solutions of the function. Choose any value for x, say 1, and find the corresponding value of $g(x)$.

$$g(1) = \frac{4}{3}e^{1}$$
$$\approx 3.62$$

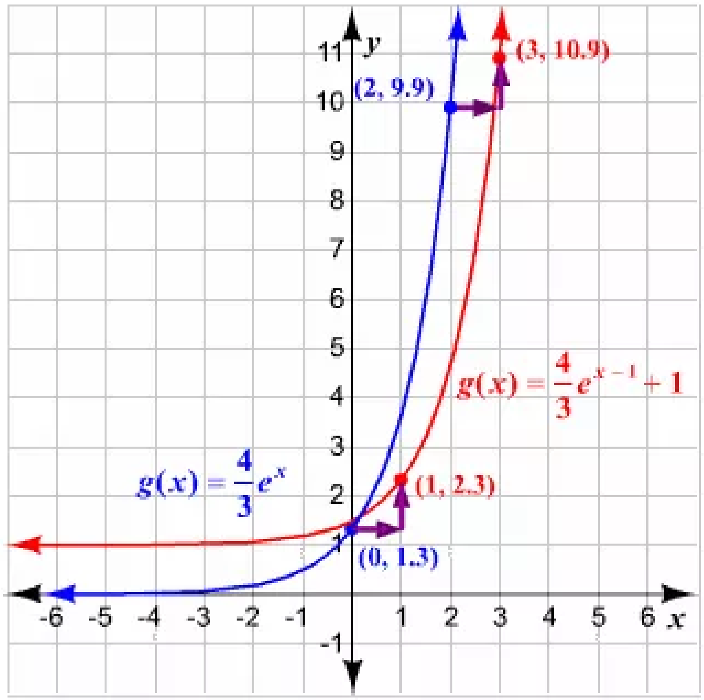
Organize the results in a table.

x	-2	0	1	1.5	2
y	0.2	1.3	3.6	5.9	9.9

Now, plot the points on a coordinate plane and connect them with a smooth curve.



Finally, translate the graph of $g(x) = \frac{4}{3}e^x$ one unit to the right and one unit up.



The domain of a function is the set of all input values and the range is the set of all output values.

From the figure, we can find that the input values include all real numbers whereas the output values include only real numbers greater than 1. Therefore, the domain is the set of all real numbers and the range is $y > 1$.

Answer 50e.

Graphing the natural base function $h(x)=e^{-2(x+1)}-3$

The function $h(x)=e^{-2(x+1)}-3$ is in the form $y=ae^{rx}$

Where in this case $a=1$ is positive and $r=-2$ is negative

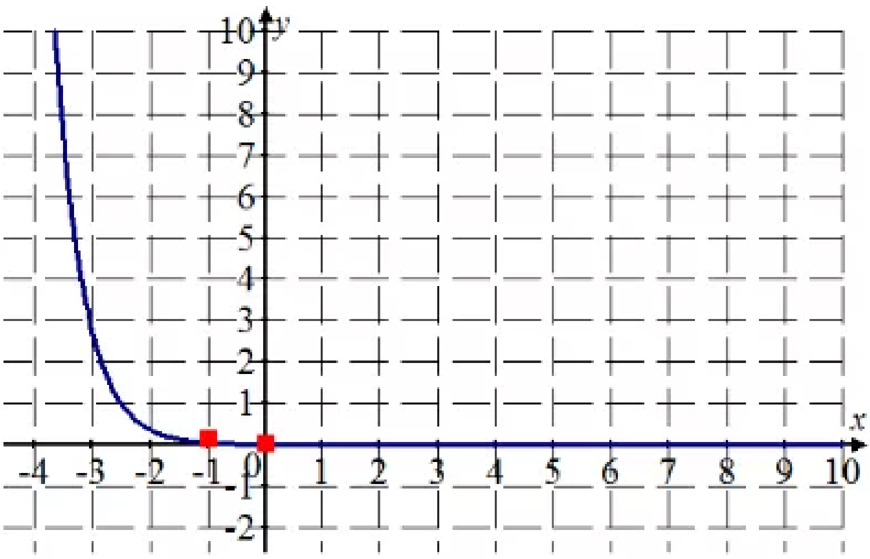
The function is an exponential decay function.

On substituting the values in the given function get the corresponding points

Where it intersects

Let 0, 1 be the point in given function then values are given below

Plot the points $(0,-2.86)$ and $(1,-2.98)$ translate left 1 unit and down 3 units to obtain the points $(-1,0.14)$ and $(0,0.02)$ draw the curve:



The domain is all real numbers and the range is $y>0$

Answer 51e.

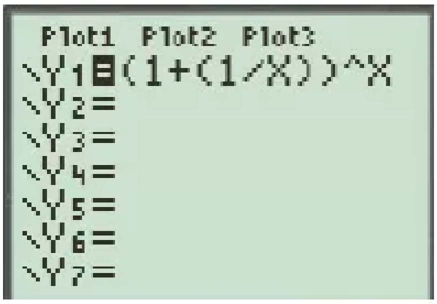
Using the table feature of a graphing calculator to find the value of *n* for which $\left(1+\frac{1}{n}\right)^n$ gives the value of *e* correct to 9 decimal places.

Plug in $\left(1+\frac{1}{n}\right)^n$ to your graphing calculator.

The approximate value of e with first 9 decimals is

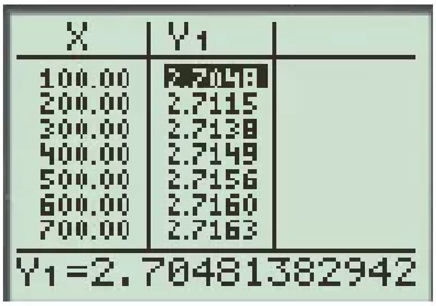
$e=2.718281828$

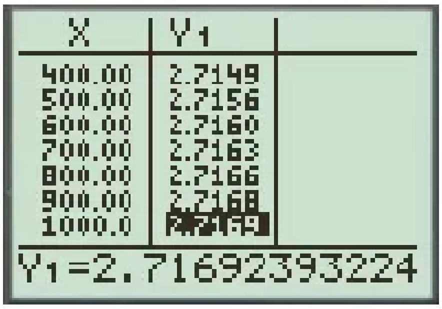
Use the key of **Y =** to enter the function



Set the table with starting point at 100 with increment as 100

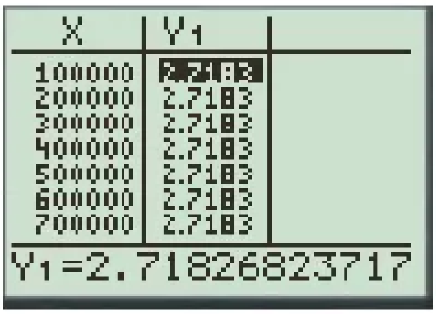
Use the key of ***2nd*** ***Graph*** to construct the table

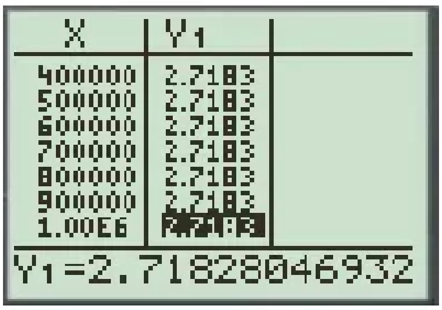




In this case the first two decimal places are match with value of e

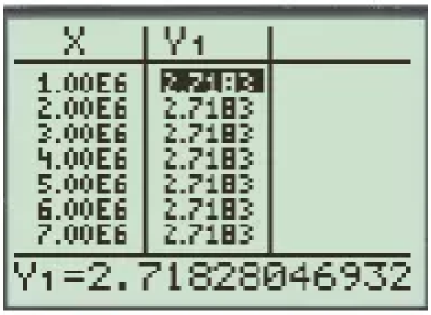
Set the table with starting point at 100,000 with increment as 10,000

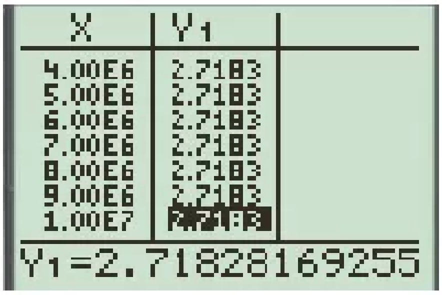




In this case the first five decimal places are match with value of e

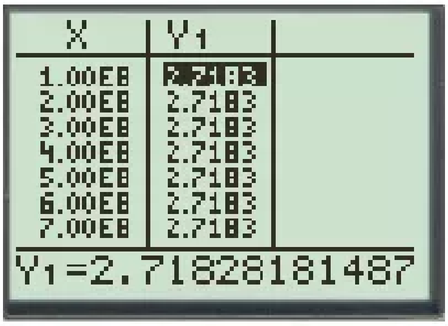
Set the table with starting point at 1,000,000 with increment as 1,000,000

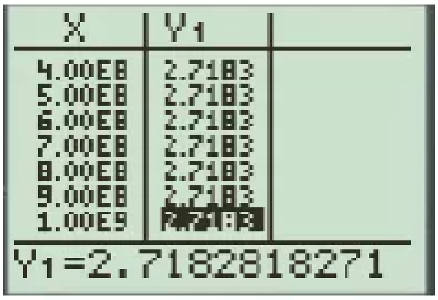




In this case the first six decimal places are match with value of e

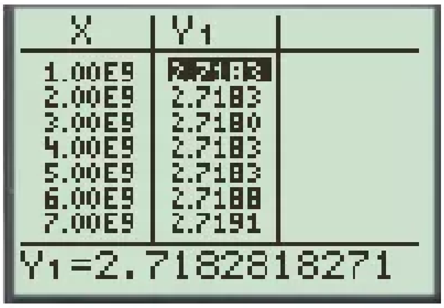
Set the table with starting point at 100,000,000 with increment as 100,000,000

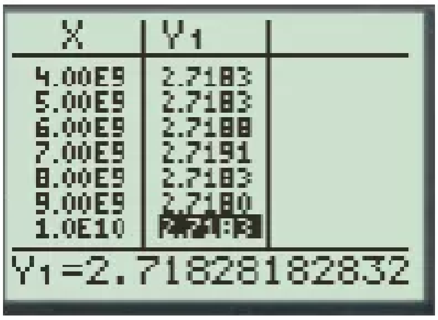




In this case the first eight decimal places are match with value of e

Set the table with starting point at 1,000,000,000 with increment as 1,000,000,000





In this case the first nine decimal places are match with value of e

The approximate value of n is **10,000,000,000**

Answer 52e.

No, e cannot be expressed as a ratio of two integers; e is irrational which by definition means it cannot be expressed as a ratio of two integers. A number that can be expressed in such a ratio is called rational.

Answer 53e.

A function of the form $y = ae^{rx}$ is called an exponential decay function if $a > 0$ and $r < 0$. In this case, $f(x)$ and $g(x)$ are given as exponential decay functions. Thus, $a > 0$, $b > 0$, $r < 0$, and $q < 0$.

Apply the quotient of powers property and simplify to find $\frac{f(x)}{g(x)}$.

$$\begin{aligned}\frac{f(x)}{g(x)} &= \frac{ae^{rx}}{be^{qx}} \\ &= \frac{a}{b}e^{rx-qx} \\ &= \frac{a}{b}e^{(r-q)x}\end{aligned}$$

Since $\dfrac{f(x)}{g(x)}$ is given as an exponential growth function, $r - q > 0$. Thus, $r > q$.

Choose any values for a, b, r, and q such that they satisfy the above conditions.

$a = \dfrac{1}{2}, r = -3,\ b = \dfrac{2}{3}, q = -5$

Thus, $f(x) = \dfrac{1}{2}e^{-3x}$ and $g(x) = \dfrac{2}{3}e^{-5x}$.

Answer 54e.

Let $m = \dfrac{n}{r}$. Multiplying both sides by r:

$m = \dfrac{n}{r}$

$mr = n$

Now, substitute $n = mr$ in the formula:

$A = P\left(1 + \dfrac{r}{n}\right)^{nt}$

$A = P\left(1 + \dfrac{r}{mr}\right)^{mrt}$

$A = P\left(1 + \dfrac{1}{m}\right)^{mrt}$

As n approaches infinity, so will because $m = \dfrac{n}{r}$, As m approaches infinity, $\left(1 + \dfrac{1}{m}\right)^{m}$ will approach e.

Now we will substitute e for $\left(1 + \dfrac{1}{m}\right)^{m}$.

$A = Pe^{rt}$

Answer 55e.

We know that $x = 0$ corresponds to the year 1997. Since $2002 - 1997 = 5$, the value of x that corresponds to the year 2002 is 5.

For finding the number of camera phones that were shipped in 2002, first substitute 5 for x in the given function.

$y = 1.28e^{1.31(5)}$

Evaluate.

$$y = 1.28e^{6.55}$$
$$\approx 895$$

Therefore, approximately 895 million camera phones were shipped in 2002.

Answer 56e.

Scientists used traps to study the Formosan subterranean termite population in New Orleans. The mean number y of termites collected annually can be modeled by $y = 738e^{0.345t}$ where t is the number of years since 1989.

Since t represent number of year since 1989, subtract 1989 from the year in equation 1999.

$1999 - 1989 = 10$

Substitute 10 for t in the modeled to find the mean number:

$y = 738e^{0.345 \cdot 10}$	Substitute
$y = 738e^{3.45}$	Multiply the exponent
$y = 738 \cdot 31.5$	Apply exponent
$y = 23247.3$	Multiply

Thus the mean number is $\boxed{23247.3}$.

Answer 57e.

The amount A in an account after t years for a continuously compounded interest is given by the formula $A = Pe^{rt}$ where P is the principal and r is the annual interest rate expressed as a decimal.

In this case, the principal is \$2000, annual interest expressed in decimal is 0.04, and the time is 5 years.

First, substitute 2000 for P, 0.04 for r, and 5 for t in the formula.

$A = 2000e^{0.04(5)}$

Now, evaluate using a calculator.

$$A = 2000e^{0.2}$$
$$\approx 2442.81$$

The balance after 5 years is about \$2442.81

Answer 58e.

We are looking for the balance after 12.5 years. Here future value is A and principle is P which for this problem is $800. Interest rate is 2.65% or 0.0265. The number of year the interest accumulates is $t = 12.5$.

Substute all the value in the furmula $A = Pe^{rt}$:

$A = 800e^{0.0265 \cdot 12.5}$ Substitute

$A = 800e^{0.33125}$ Multiply the exponent

$A = 800 \cdot 1.293$ Apply exponent

$A = 1114.16$ Multiply

Thus the balance after 12.5 year is $\boxed{\$1114.16}$.

Answer 59e.

a) The value of k in clear water is given as -0.02. For writing an equation that gives the percent of surface light that filters down through clear water, substitute -0.02 for k in the given function.

$L(x) = 100e^{-0.02x}$

In order to graph the function $L(x) = 100e^{-0.02x}$, first we have to find some points on the graph. Choose some values for x, say, 1 and find the corresponding values of y.

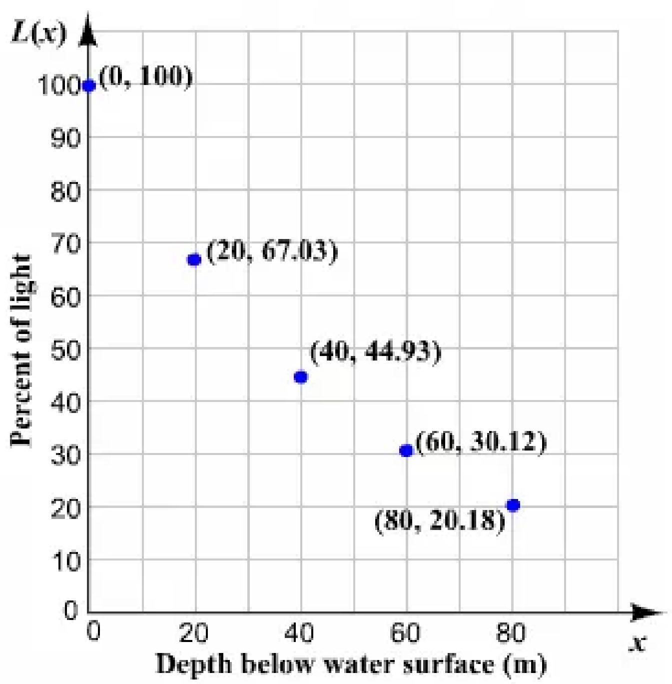
$$L(0) = 100e^{-0.02(0)}$$
$$= 100$$

Organize the results in a table.

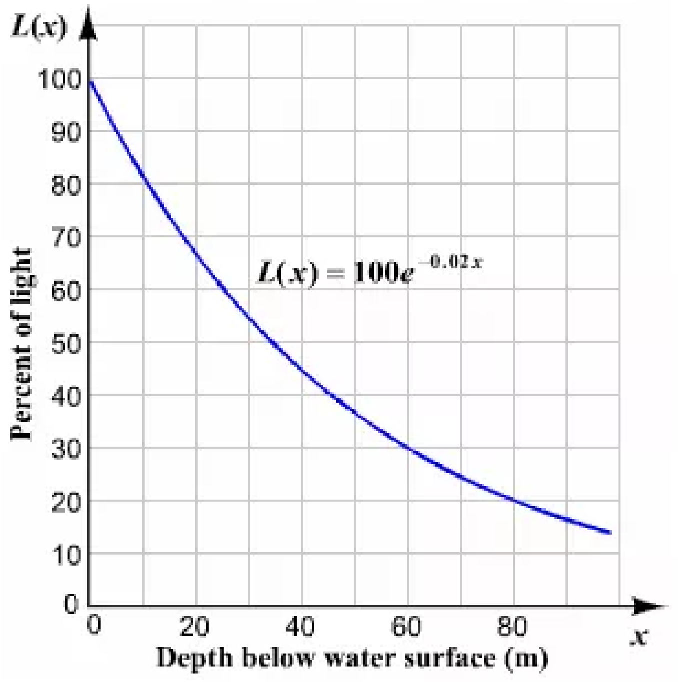
x	0	20	40	60	80
y	100	67.03	44.93	30.12	20.18

Now, draw a coordinate plane and label the horizontal axis "Depth below water surface (m)" and the vertical axis "Percent of light."

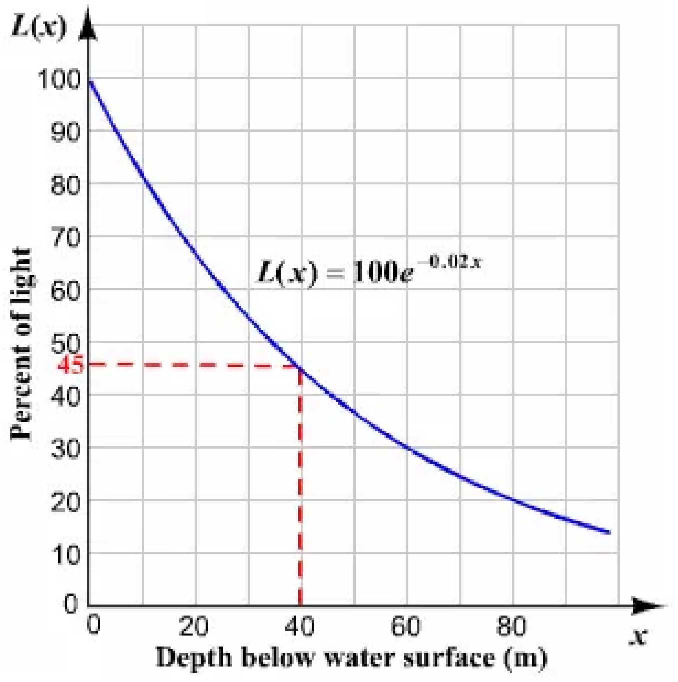
Plot the points on the coordinate plane.



Finally, connect the points with a smooth curve.

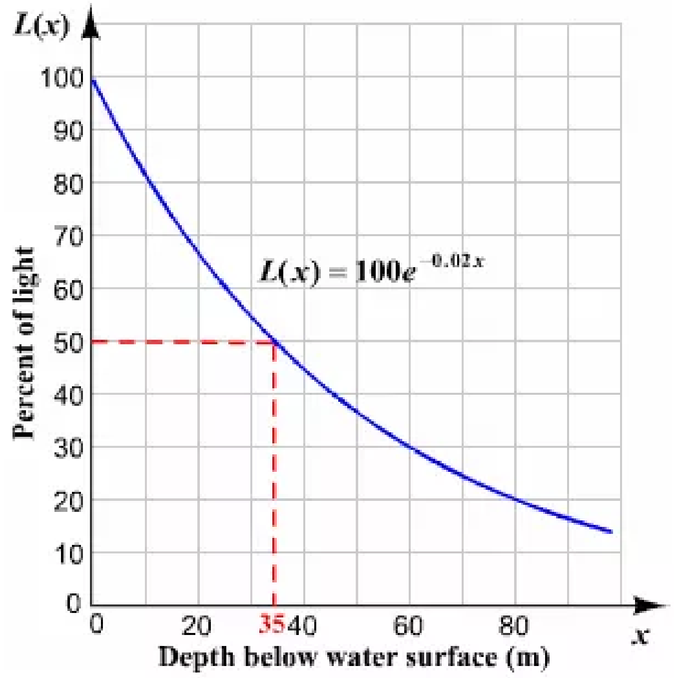


b) Identify the L-value that corresponds to the x-value 40.



From the graph, we find that when x is 40, $L(x)$ is about 45. Thus, we can conclude that about 45% of surface light is available at a depth of 40 meters.

c) Identify the x-value that corresponds to the L-value 50.



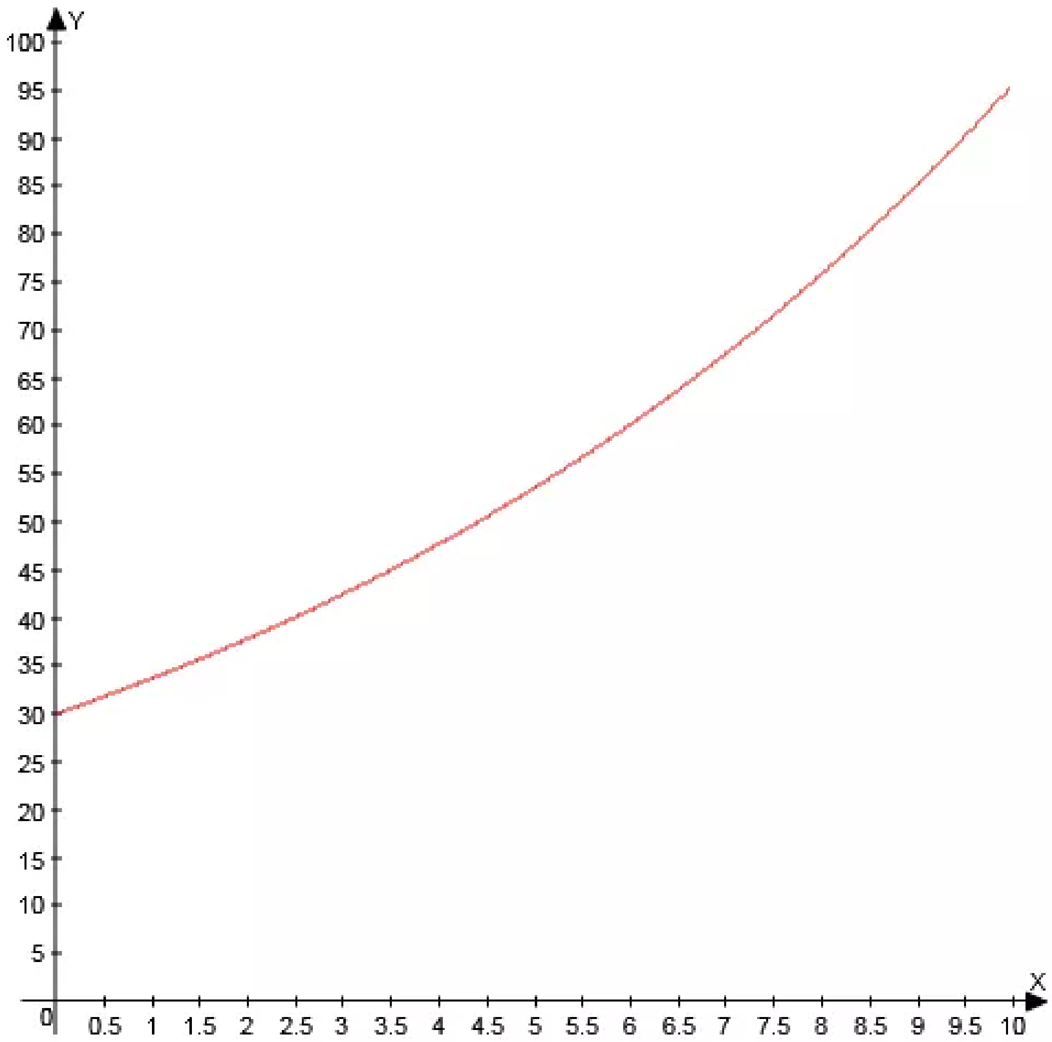
From the graph, we find that when $L(x)$ is 50, the value of x is about 35. Therefore, the submersible can descend to a depth of about 35 meters in clear water before only 50% of surface light is available.

Answer 60e.

The growth of the bacteria mycobacterium tuberculosis can be modeled by the function $P(t) = P_0 e^{0.116t}$ where $P(t)$ is the population after t hours and P_0 is the population when $t = 0$.

a) Here starting population $P_0 = 30$, so the function for the number of bacteria after 1:00 P.M. is $\boxed{P(t) = 30e^{0.116t}}$.

b) Graph of the function $P(t)=30e^{0.116t}$ is as shown below:



c) The population at 5:00 P.M. that would be 4 hours later so $t=4$.
Substitute 4 for t to find the population at 5:00 P.M.

$P(4)=30e^{0.116 \cdot 4}$	Substitute
$P(4)=30e^{0.464}$	Multiply the exponent
$P(4)=30 \cdot 1.59$	Apply exponent
$P(4)=47.71$	multiply

Thus the population at 5:00 P.M. is $\boxed{48}$.

d) To find the population at 3:45, we would have to figure out the time. 2 hours and 45 minutes have passed. For the equation time need to be in hours so this would convert to 2.75 hours and substitute for t in the equation and find $P(2.75)$.

Answer 61e.

First, substitute for A_0 and t in the given model.
$A = 4e^{-0.05(14)}$

Now, evaluate using a calculator.
$A \approx 1.986$

Thus, the area of the wound after 14 days is about 1.986 square centimeters.

Answer 62e.

The height *y* (in feet) of the Gateway Arch in St. Louis, Missouri, can be modeled by the function

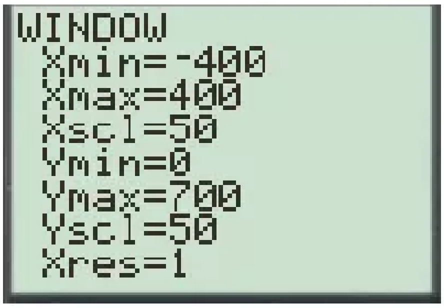
$$y = 757.7 - 63.85\left(e^{x/127.7} + e^{-x/127.7}\right)$$

Where *x* is the horizontal distance (in feet) from the center of the arch

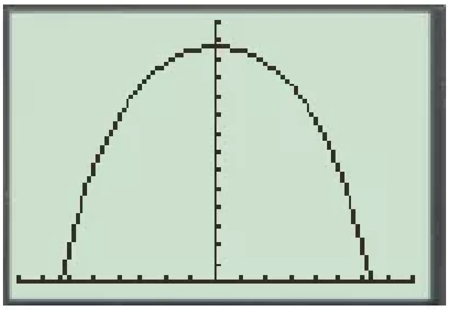
a)

Use the key of $\boxed{Y =}$ to enter the function

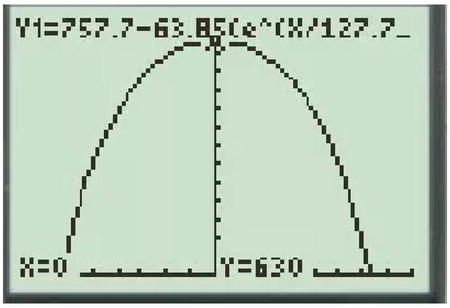
Use the key of $\boxed{WINDOW}$ to set the following window to draw the graph of function



Use the key of **GRAPH** to draw the graph of function



Use the key of **Trace** to find the maximum height of the arch



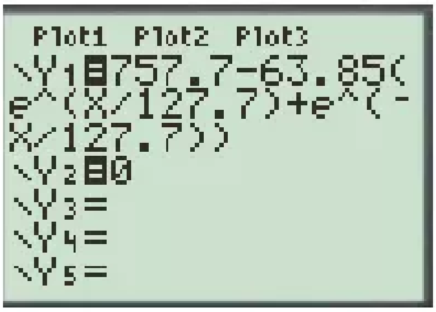
From the above window the tall of the arch at its highest point is 630

(b)

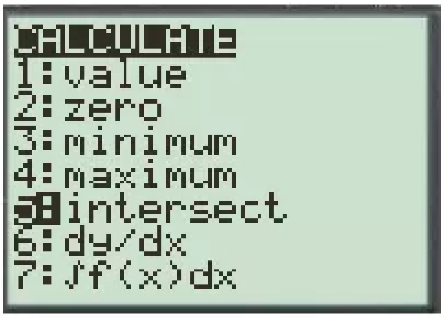
In this case the trace option is not given exactly end points

So use the key of intersect to find the end points of arch

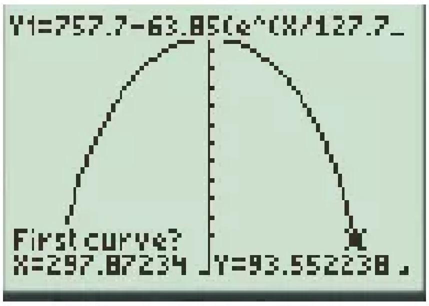
For this enter the second curve as x-axis

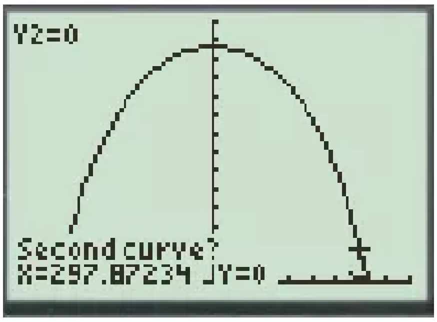


Use the key of **2nd** **trace** and choose the option intersection as the number of 5

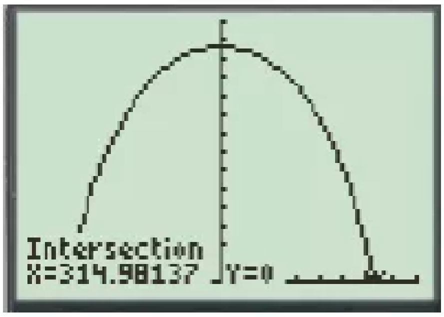


Use left, right and up and down arrows to choose nearest point on each curves to end points of the arch





Use key of **ENTER** **ENTER** to get right end point of arch



The graph is symmetric about $y-axis$ so other end point of arch is

$$(-314.98137, 0)$$

Answer 63e.

By the definition of absolute value, the given equation is equivalent to the equations $x+8=-13$ or $x+8=13$.

Solve the two equations for x. Subtract 8 from each side of the two equations and simplify.

$$x+8-8=-13-8 \quad \text{or} \quad x+8-8=13-8$$
$$x=-21 \qquad\qquad x=5$$

The solutions appear to be -21 and 5.

Check the solutions by substituting them in the original equation.

$$|x+8|=13 \qquad |x+8|=13$$
$$|-21+8|\stackrel{?}{=}13 \qquad |5+8|\stackrel{?}{=}13$$
$$|-13|=13\ \checkmark \qquad 13=13\ \checkmark$$

The solutions check.

Thus, the solutions of the given equation are 21 and 5.

Answer 64e.

Solving the equation:

$|3x+17|=16$

This equation will solve in two case:

Case 1

$3x+17=16$

$3x=-1$ Subtracr 17

$x=-\frac{1}{3}$ Divide both sides by 3

Case 2

$3x+17=-16$

$3x=-33$ Subtracr 17

$x=-11$ Divide both sides by 3

Thus the solutions are $\boxed{-\frac{1}{3},-11}$.

Answer 65e.

The given equation is in standard form.
The solutions of a quadratic equation of the form $ax^2 + bx + c = 0$ are

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$, where a, b, c are real numbers and $a \neq 0$.

Substitute 2 for a, -4 for b, and 9 for c in the formula.

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(2)(9)}}{2(2)}$$

Evaluate.

$$\begin{aligned} x &= \frac{4 \pm \sqrt{16 - 72}}{4} \\ &= \frac{4 \pm \sqrt{-56}}{4} \\ &= \frac{4 \pm 2\sqrt{-14}}{4} \\ &= 1 \pm \frac{1}{2}\sqrt{-14} \end{aligned}$$

Use the imaginary unit to rewrite.

$$x = 1 \pm \frac{1}{2} i\sqrt{14}$$

Therefore, the solutions are $1 + \frac{1}{2} i\sqrt{14}$ and $1 - \frac{1}{2} i\sqrt{14}$.

The solutions can be checked using a graphing utility.

Answer 66e.

Solving the equation:

$x^2 + 12x - 3 = 0$

This equation is not factorable, so we must use the quadratic formula $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

The given equation is in standard form.

Here, $a = 1$, $b = 12$, $c = -3$

Substitute these values into the quadratic formula and simplifying gives the equation's solution:

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	Use the quadratic formula
$x = \dfrac{-(12) \pm \sqrt{(12)^2 - 4(1)(-3)}}{2(1)}$	Substitute
$x = \dfrac{-12 \pm \sqrt{144 + 12}}{2}$	Simplify
$x = \dfrac{-12 \pm \sqrt{156}}{2}$	Add
$x = \dfrac{-12 \pm 2\sqrt{39}}{2}$	
$x = -6 \pm \sqrt{39}$	Factor out 2 from numerator and denominator

Thus the solution is $\boxed{-6 \pm \sqrt{39}}$

Answer 67e.

Square both sides of the equation to eliminate the radical.

$$\left(\sqrt{5x + 9}\right)^2 = 7^2$$

$$5x + 9 = 49$$

Solve for x.

Subtract 9 from both the sides.

$$5x + 9 - 9 = 49 - 9$$

$$5x = 40$$

Divide both the sides by 5.

$$\frac{5x}{5} = \frac{40}{5}$$

$$x = 8$$

The solution to the equation appears to be 8.

Substitute 8 for x in the original equation and check.

$$\sqrt{5x+9} = 7$$

$$\sqrt{5 \cdot 8 + 9} \stackrel{?}{=} 7$$

$$\sqrt{49} \stackrel{?}{=} 7$$

$$7 = 7 \checkmark$$

The solution checks.

Answer 68e.

Solving the equation:

$$\sqrt{15x+34} = x+6$$

$15x+34=(x+6)^2$	Square both sides
$15x+34=x^2+12x+36$	Apply exponents
$15x=x^2+12x+2$	Subtract 34
$0=x^2-3x+2$	Subtract $15x$
$0=x^2-2x-x+2$	Factor $-3x=-2x-x$
$0=x(x-2)-1(x-2)$	
$0=(x-2)(x-1)$	

Using zero-factor property

$x-2=0$ or $x-1=0$

$x=2$ or $x=1$

Thus the solutions are $\boxed{\{2,1\}}$.

Answer 69e.

Replace $f(x)$ with y.

$y = 2x$

Switch x and y of the equation.

$x = 2y$

Divide each side by 2 to solve for y.

$$\frac{x}{2} = \frac{2y}{2}$$

$$\frac{x}{2} = y \quad \text{or} \quad y = \frac{x}{2}$$

Replace y with $f^{-1}(x)$.

$$f^{-1}(x) = \frac{x}{2}$$

The inverse of the given function is $f^{-1}(x) = \frac{x}{2}$.

Answer 70e.

Finding the inverse function:

To find the inverse of $f(x)$, replace $f(x)$ with y, swap x and y, and then solve for y which will equal to $f^{-1}(x)$.

$f(x) = 5x - 3$

$y = 5x - 3$	Replace $f(x)$ with y
$x = 5y - 3$	Swap x and y
$x + 3 = 5y$	Add 3
$\frac{x+3}{5} = y$	Divide both sides by 5
$\frac{x+3}{5} = f^{-1}(x)$	Replace y with $f^{-1}(x)$

Thus the inverse function is $\boxed{f^{-1}(x) = \frac{x+3}{5}}$.

Answer 71e.

Replace $f(x)$ with y.

$y = -4x + 14$

Switch x and y of the equation.

$x = -4y + 14$

Subtract 14 from each side.

$x - 14 = -4y + 14 - 14$

$x - 14 = -4y$ or $-4y = x - 14$

Solve for y.

Divide each side by -4.

$$\frac{-4y}{-4} = \frac{x - 14}{-4}$$

$$y = \frac{-x + 14}{4}$$

Replace y with $f^{-1}(x)$.

$$f^{-1}(x) = \frac{-x + 14}{4}$$

The inverse of the given function is $f^{-1}(x) = \frac{-x + 14}{4}$.

Answer 72e.

Finding the inverse function:

To find the inverse of $f(x)$, replace $f(x)$ with y, swap x and y, and then solve for y which will equal to $f^{-1}(x)$.

$f(x)=\frac{1}{3}x+4$

$y=\frac{1}{3}x+4$ Replace $f(x)$ with y

$x=\frac{1}{3}y+4$ Swap x and y

$3x=y+12$ Multiply both sides by 3

$3x-12=y$ Subtract 12

$3x-12=f^{-1}(x)$ Replace y with $f^{-1}(x)$

Thus the inverse function is $\boxed{f^{-1}(x)=3x-12}$.

Answer 73e.

Replace $f(x)$ with y.

$y=-12x-6$

Switch x and y of the equation.

$x=-12y-6$

Add 6 to each side.

$x+6=-12y-6+6$

$x+6=-12y$ or $-12y=x+6$

Solve for y.

Divide each side by -12.

$$\frac{-12y}{-12}=\frac{x+6}{-12}$$

$$y=\frac{-x-6}{12}$$

Replace y with $f^{-1}(x)$.

$$f^{-1}(x)=\frac{-x-6}{12}$$

The inverse of the given function is $f^{-1}(x)=\frac{-x-6}{12}$.

Answer 74e.

Finding the inverse function:

To find the inverse of $f(x)$, replace $f(x)$ with y, swap x and y, and then solve for y which will equal to $f^{-1}(x)$.

$f(x) = -\frac{1}{4}x + 7$

$y = -\frac{1}{4}x + 7$	Replace $f(x)$ with y
$x = -\frac{1}{4}y + 7$	Swap x and y
$-4x = y - 28$	Multiply both sides by -4
$28 - 4x = y$	Add 28
$28 - 4x = f^{-1}(x)$	Replace y with $f^{-1}(x)$

Thus the inverse function is $\boxed{f^{-1}(x) = 28 - 4x}$.