Name: KEY Date: _____ Period: _____

it 10—Other Linear and Non-Linear Functions

#1-10: Label each equation as direct variation, inverse variation, exponential growth, or exponential decay.

1. Direct Variation $y = 3x$ no b for $y = mx + b$
2. Exponential Growth $y = 3(7)^x$ $b > 1$
3. Exponential Decay $y = 4\left(\frac{1}{5}\right)^x$
4. Direct Variation $y = \frac{x}{2}$ $= y = \frac{1}{2}x$
5. Inverse Variation $y = \frac{8}{x}$
6. Exponential Decay $y = 25(1 - 0.25)^x$ .75
7. Inverse Variation $y = \frac{3}{x}$
8. Direct Variation $y = \frac{1}{6}x$
9. Exponential Growth $y = 100(1 + 2.6)^x$ 3.6
10. Direct Variation $y = 5x$

Write the function (equation) to represent the relationship.

1. The value of y varies directly with x. Write the function that represents the relationship between x and y if $y = 25$ when $x = 5$?
   $k = \frac{y}{x} = \frac{25}{5} = 5$ $\boxed{y = 5x}$
2. The value of y varies directly with x. Write the function that represents the relationship between x and y if $y = \frac{20}{6}$ when $x = 18$?
   $k = \frac{\frac{20}{6}}{18} = \frac{20}{6} \cdot \frac{1}{18} = \frac{20}{108} = \frac{5}{27}$ $\boxed{y = \frac{5}{27}x}$
3. The value of y varies inversely with x. Write the function that represents the relationship between x and y if $y = 5$ when $x = 3$?
   $k = yx = 5(3) = 15$ $\boxed{y = \frac{15}{x}}$
4. The value of y varies inversely with x. Write the function that represents the relationship between x and y if $y = 2$ when $x = 7$?
   $k = 2(7) = 14$ $\boxed{y = \frac{14}{x}}$

5. The number of cakes baked (y) varies directly with the number of hours it takes (x) to bake. Write an equation that can be used to find the number of cakes baked for any number of hours, if 16 cakes are baked in 4 hours.

$k = \frac{16}{4} = 4$ $\boxed{y = 4x}$

6. The speed you must go to cover a certain distance is inversely proportional to the time of the trip. Suppose you must travel 54 miles per hour to complete your trip if it takes you 4 hours. How fast must you travel to complete your trip in 3 hours?

$k = 54(4) = 216$ $\boxed{y = \frac{216}{x}}$ $\frac{216}{3} = \boxed{72 \text{ mph}}$

Solve for the missing variable:

1. If y varies directly as x and $y = 200$ when $x = 40$, find y when $x = 8$.

$\frac{200}{40} = \frac{y}{8}$ $\frac{40y}{40} = \frac{1600}{40}$ $y = 40$ $\boxed{y = 40}$

2. The value of y is inversely proportional to x. If y is 12 when x is 5, find the value of x when y is 3.

$12(5) = x(3)$ $\frac{60}{3} = \frac{3x}{3}$ $x = 20$ $\boxed{x = 20}$

3. If y varies directly as x and $y = 5$ when $x = 8$, find x when $y = 25$.

$\frac{5}{8} = \frac{25}{x}$ $\frac{5x}{5} = \frac{200}{5}$ $\boxed{x = 40}$

4. The value of y is varies inversely to x. If y is 13 when x is 4, find the value of y when x is 2.

$13(4) = y(2)$ $\frac{52}{2} = \frac{2y}{2}$ $\boxed{y = 26}$

Consider each of the following tables. Label each as direct variation, inverse variation, exponential growth, or exponential decay. Next, write the equation that represents each table of data.

↑ x	↑ y
1	3
2	9
3	27
4	81
5	243

×3 ×3 ×3 ×3

Type: Exp. Growth

Equation: $y = 3^x$

↑ x	↑ y
-1	-6
1	6
3	18
5	30
7	42

$\frac{-6}{-1} = 6$ $\frac{6}{1} = 6$ $\frac{18}{3} = 6$ $\frac{30}{5} = 6$ $\frac{42}{7} = 6$

Type: Direct Variation

Equation: $y = 6x$

↑ x	↓ y
1	12
2	6
3	4
4	3
6	2

$1 \times 12 = 12$ $2 \times 6 = 12$ $3 \times 4 = 12$ $4 \times 3 = 12$ $6 \times 2 = 12$

Type: Inverse Variation

Equation: $y = \frac{12}{x}$

Consider each of the following tables. Label each as direct variation, inverse variation, exponential growth, or exponential decay. Next, write the equation that represents each table of data.

x	y
1	104
2	52
3	26
4	13
5	6.5

Type: Exp Decay

Equation: $y = 208\left(\frac{1}{2}\right)^x$

x	y
0	1
1	5
2	25
3	125
4	625

Type: Exp Growth

Equation: $y = 1(5)^x$ or $y = 5^x$

x	y
-25	-2
-10	-5
-5	-10
-2	-25
-1	-50

Type: Inverse Variation

Equation: $y = \frac{50}{x}$

Evaluate the following functions for the specified x-value:

1. Evaluate $f(x) = 12(2)^x$, if $x = -3$

$f(-3) = 12(2)^{-3}$

$f(-3) = 1.5$

2. Evaluate $f(x) = 3(\frac{2}{3})^x$, if $x = 4$

$f(4) = 3\left(\frac{2}{3}\right)^4$

$f(4) = \frac{16}{27} \approx .59$

3. Evaluate $f(x) = 8(\frac{1}{2})^x$, if $x = 7$

$f(7) = 8\left(\frac{1}{2}\right)^7$

$f(7) = .0625$

4. Evaluate $f(x) = 24(1 - .02)^x$, if $x = 12$

$f(12) = 24(1 - .02)^{12}$

$f(12) \approx 18.83$

Write the equation and solve:

1. A rabbit population triples every year. If I start with 4 rabbits, how many rabbits will I have in 5 years?

b>1 growth

$y = 4(3)^5$

$y = 972$ rabbits

2. The new drug to treat SARS has a half-life of 1 hours. If 50cc is initially administered, how much will still be in your system 24 hours later?

0<b<1 decay

$y = 50\left(\frac{1}{2}\right)^{24}$

$y = .0000298$ cc's

3. A small town's population in a year 1930 was 4,210. If we know that the population grew at a rate of 4.5% per year, what was the population in the year 1946?

growth

$a = 4210$

$b = 1 + .045$

$x = 1946 - 1930 = 16$

$y = 4210(1+.045)^{16}$

$y = \approx 8,514$ people

4. In 1997, the population of humpback whales was decreasing at a rate of 7.4% per year. If there were 176,534 whales in 1997, how many would you expect to in 2005?

decay

$a = 176534$

$b = 1 - .074$

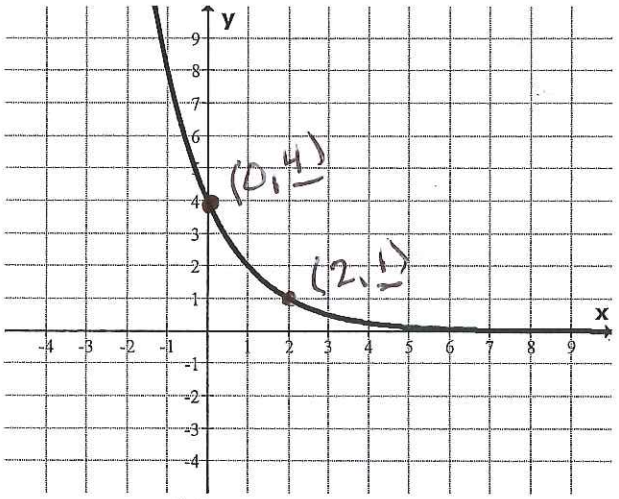
$x = 2005 - 1997 = 8$

$y = 176534(1-.074)^8$

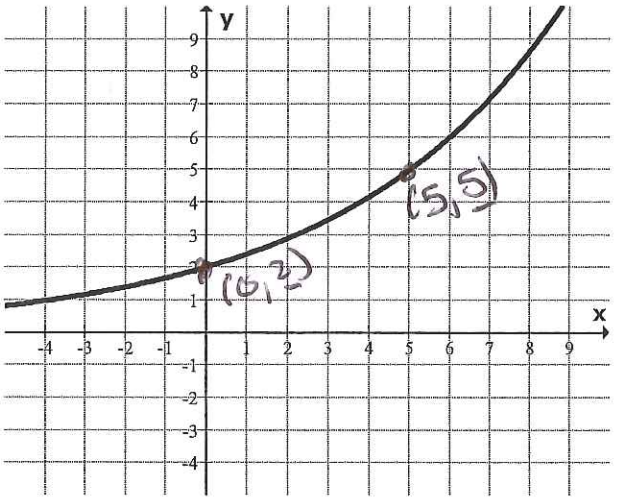
$y = \approx 95437$ whales

Look at the following graphs and find the given values:

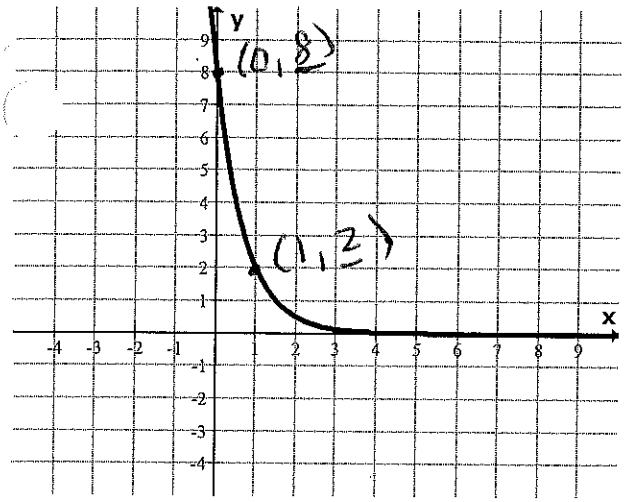
Asking... What is y when x = ___



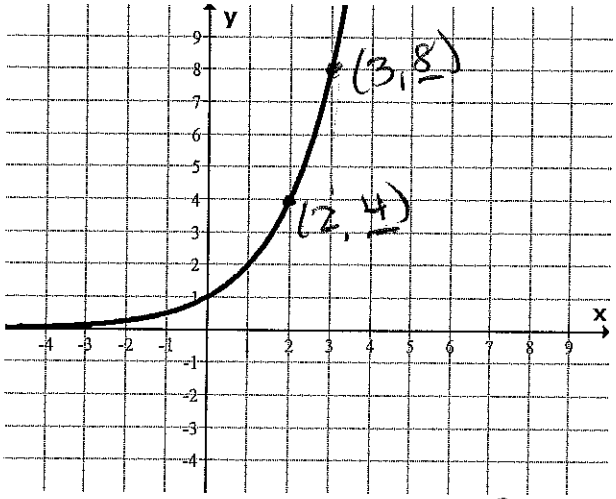
f(0) = 4 (x=0) f(2) = 1 (x=2)



f(0) = 2 f(5) = 5

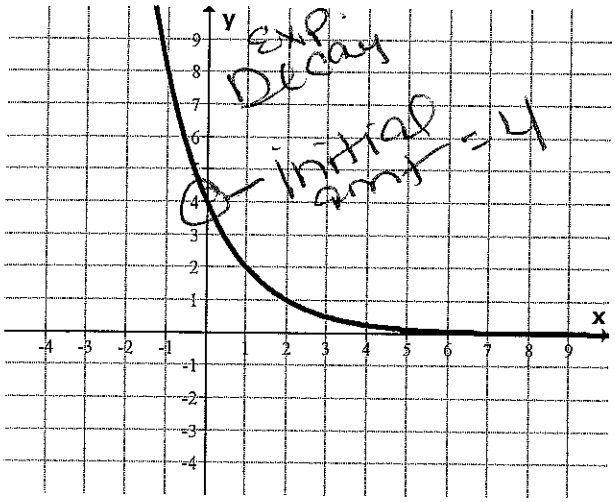


f(0) = 8 f(1) = 2

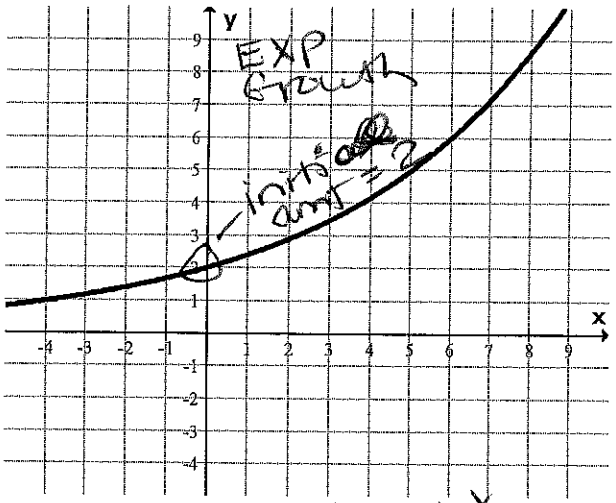


f(2) = 4 f(3) = 8

Match the graphs to their equation. Use the equation bank below the graphs:



Equation: $y = 4(\frac{1}{2})^x$



Equation: $y = 2(1.2)^x$

Equation Bank:

$y = 2\left(\frac{1}{2}\right)^x$ decay

$y = 4\left(\frac{1}{2}\right)^x$ decay

$y = 2(1.2)^x$ growth

$y = 4(2)^x$ growth