

Simplify 1 - 3 below. Do not leave any negative exponents.

$$1) (3x^3y^{-4}z)^2(-5x^{-4}y^2z)$$

$$= (9x^6y^{-8}z^2)(-5x^{-4}y^2z)$$

$$= -45x^{6+(-4)}y^{-8+2}z^{2+1}$$

$$= \boxed{\frac{-45x^2z^3}{y^6}}$$

$$2) \frac{(2y^{-3}z)^3}{2x^6y^3z^2 \cdot 2x^{-3}y^{-4}z^4}$$

$$= \frac{8y^{-9}z^3}{4x^{-3}y^{-1}z^6}$$

$$= 2x^3y^{-9-(-1)}z^{3-6}$$

$$= \boxed{\frac{2x^3}{y^8z^3}}$$

$$3) \left(\frac{3xy^3}{2x^2y^4 \cdot x^4y^{-2}}\right)^3$$

Simplify =

$$\left(\frac{3xy^3}{2x^6y^2}\right)^3$$

$$= \frac{27x^3y^9}{8x^6y^6} = \frac{27x^{3-6}y^{9-6}}{8} = \frac{27y^3}{8x^3}$$

$$= \boxed{\frac{27y^3}{8x^3}}$$

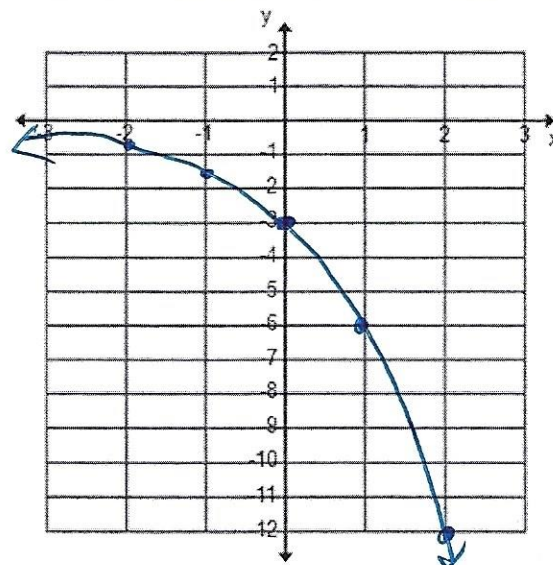
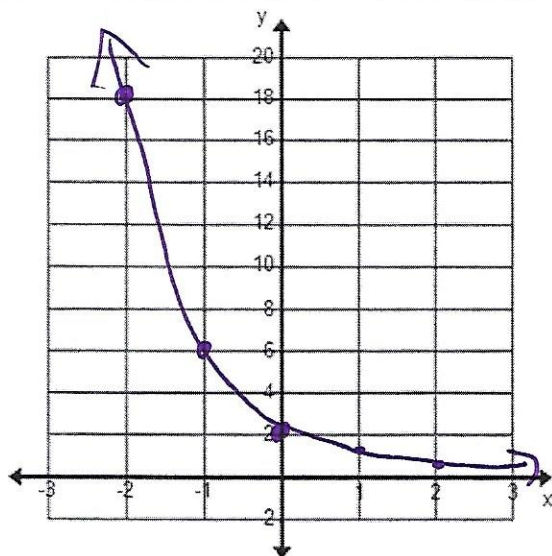
Graph the following exponential functions. Find the y-intercept. Complete the table, plot the points and connect. Then, answer the questions for each function below the graph.

4) $y = 2\left(\frac{1}{3}\right)^x$ y-intercept: (0, 2)

5) $f(x) = -3 \cdot 2^x$ y-intercept: (0, -3)

x	-2	-1	1	2
y	18	6	2/3	2/9

x	-2	-1	1	2
y	-3/4	-3/2	-6	-12



Increasing/Decreasing? Decreasing
 Domain: \mathbb{R} Range: $(0, \infty)$
 End behavior: As $x \rightarrow -\infty, y \rightarrow \infty$
As $x \rightarrow \infty, y \rightarrow 0$

Increasing/Decreasing? Decreasing
 Domain: \mathbb{R} Range: $(-\infty, 0)$
 End behavior: As $x \rightarrow -\infty, y \rightarrow 0$
As $x \rightarrow \infty, y \rightarrow -\infty$

Write the equation for the table below.

6)

x	1	2	3	4	5
y	27	9	3	1	1/3

$\div 3$ or $(\frac{1}{3})$ $y = 81(\frac{1}{3})^x$

7) Since January 2010, the population of the city of Brownville has grown according to the mathematical model, $y = 720,500(1.022)^x$, where x is the number of years since January 2010.

a) Explain what the number 720,500 represents in this model.

The initial population in 2010.

b) Is this an example of a growth or decay function? growth! ($1.022 > 1$)

c) Find the growth/decay factor. 1.022

d) Find the growth/decay rate. Write this number as a percent. 2.2%
 $1+r=1.022$
 $r=.022$

e) What will the population be in 2021 if the growth continues at the same rate.

$2021-2010 = 11 \text{ yrs.}$ $y = 720500(1.022)^{11} \approx 915,364$

8) The value of a boat is depreciating at a rate of 4.5% per year. The boat was worth \$57,500 when it was purchased in 2008.

decay! $r = 4.5\% = .045$

a) Write the exponential function that models this situation.

$y = 57,500(.955)^x$ $1-.045 = .955$

b) Find the value of the boat in the year 2025.

$2025-2008 = 17 \text{ yrs.}$ $y = 57500(.955)^{17} \approx \$26,286.04$

9) The value of a textbook is \$129.00 and decreases at a rate of 15% per year.

decay $r = 15\% = .15$

a) Write the exponential function that models this situation.

$y = 129(.85)^x$ $1-.15 = .85$

b) Find the value of the textbook after 11 years.

$y = 129(.85)^{11} \approx \21.59

10) A painting is sold for \$1800 and its value increases by 10.5% each year after it is sold.

growth! $r = 10.5\% = .105$

a) Write the exponential function that models this situation.

$y = 1800(1.105)^x$ $1+.105 = 1.105$

b) Find the value of the painting in 20 years.

$y = 1800(1.105)^{20} \approx \$13,259.22$

Solve the exponential equations:

$$11) 5^{2x-6} = \left(\frac{1}{125}\right)^{x+7}$$

$$5^{2x-6} = \left(\frac{1}{5^3}\right)^{x+7}$$

$$5^{2x-6} = 5^{-3(x+7)}$$

$$\begin{array}{r} 2x-6 \\ +3x \end{array} = \begin{array}{r} -3x-21 \\ +3x \end{array}$$

$$\begin{array}{r} 5x-6 = -21 \\ +6 \quad +6 \end{array}$$

$$\frac{5x}{5} = \frac{-15}{5} \quad \boxed{x = -3}$$

$$12) 64^{5-x} = 2^{x+2}$$

$$2^{6(5-x)} = 2^{x+2}$$

$$6(5-x) = x+2$$

$$\begin{array}{r} 30-6x = x+2 \\ +6x \quad +6x \end{array}$$

$$\begin{array}{r} 30 = 7x+2 \\ -2 \quad -2 \end{array}$$

$$\frac{28}{7} = \frac{7x}{7}$$

$$\boxed{4 = x}$$

$$13) \left(\frac{1}{4}\right)^x = 8^{x-1}$$

$$\left(\frac{1}{2^2}\right)^x = 2^{3(x-1)}$$

$$2^{-2(x)} = 2^{3x-3}$$

$$\begin{array}{r} -2x = 3x-3 \\ -3x \quad -3x \end{array}$$

$$\frac{-5x}{-5} = \frac{-3}{-5}$$

$$\boxed{x = \frac{3}{5}}$$

$$14) 9^{2k-1} \cdot \left(\frac{1}{27}\right)^{-k} = 9^k$$

$$3^{2(2k-1)} \cdot \left(\frac{1}{3^3}\right)^{-k} = 3^{2k}$$

$$3^{4k-2} \cdot 3^{-3(-k)} = 3^{2k}$$

$$\begin{array}{r} 4k-2+3k \\ = 2k \end{array}$$

$$\underline{4k-2+3k} = 2k$$

$$\begin{array}{r} 7k-2 = 2k \\ -7k \quad -7k \end{array}$$

$$\frac{-2}{-5} = \frac{-5k}{-5}$$

$$\boxed{k = \frac{2}{5}}$$

$$15) 216^{2p} \cdot 6^{3+p} = 36^{3p}$$

$$6^{3(2p)} \cdot 6^{3+p} = 6^{2(3p)}$$

$$6p+3+p = 6p$$

$$\begin{array}{r} 3+p = 0 \\ -3 \quad -3 \end{array}$$

$$\boxed{p = -3}$$