

Section 9.1 – Exponential Functions

Alg 2 Trig G Notes



Exponential Function – $y = a \cdot b^x$ where $a \neq 0$, $b > 0$, and $b \neq 1$.

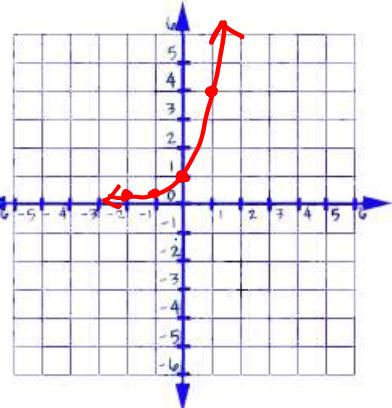
~~$y = x^2$~~

Sketch the graph of $y = 4^x$. Then state the function's domain and range.

GROWTH

<u>x</u>	<u>y</u>
-2	.0625
-1	.25
0	1
1	4
2	16

$\left\{ \begin{array}{l} D: \text{all real } \#s, \mathbb{R} \\ R: \text{all } \underline{\text{positive}} \text{ real } \#s \end{array} \right.$

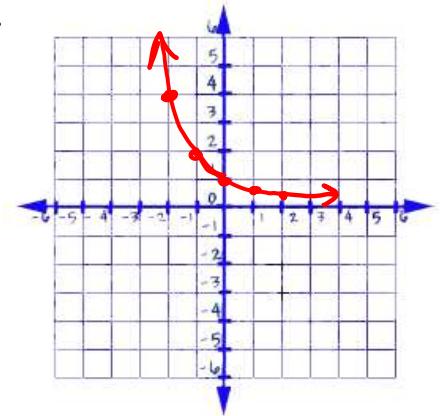


Sketch the graph of $y = \left(\frac{1}{2}\right)^x$. Then state the function's domain and range.

DECAY

<u>x</u>	<u>y</u>
-2	4
-1	2
0	1
1	.5
2	.25

$D: \text{all real } \#s, \mathbb{R}$
 $R: \text{all } \underline{\text{positive}} \text{ real } \#s$



$$b > 1 \quad b < 1 \text{ and } b > 0$$

Determine whether each function represents exponential **growth** or **decay**.

1) $y = 10 \left(\frac{4}{3}\right)^x$

GROWTH

2) $y = (0.7)^x$

DECAY

3) $y = \frac{1}{2} (5)^x$

GROWTH

4) $y = 2 \left(\frac{6}{7}\right)^x$

DECAY

5) In 1995, there were an estimated 28,154,000 cell phone subscribers in the United States. By 2005, this estimated number had risen to 194,633,000.

- a) Write an exponential function of the form $y = a \cdot b^x$ that could be used to model the number of cell phone subscribers in the US. Write the function in terms of x , the number of years since 1995.

$$y = a \cdot b^x$$

$$\frac{194,633,000}{28,154,000} = \frac{28,154,000 \cdot b^{10}}{28,154,000}$$

$$(6.913)^{\frac{1}{10}} = (b^{10})^{\frac{1}{10}}$$

$$1.213 = b \leftarrow \text{RATE}$$

$$y = 28,154,000 \cdot 1.213^x$$

- b) Estimate the number of US subscribers in 2020. $x = 25$ years

$$y = 28,154,000 \cdot 1.213^{25}$$

$$y = 3,516,091,173 \text{ people}$$

6) Solve each equation: * get a common base * then set exponents equal

a) $4^{9n-2} = 256$

$$4^{9n-2} = 4^4$$

$$9n-2 = 4$$

$$9n = 6$$

$$n = \frac{6}{9} = \boxed{\frac{2}{3}}$$

b) $3^{5x} = 9^{2x-1}$

$$3^{5x} = 3^{2(2x-1)}$$

$$5x = 2(2x-1)$$

$$5x = 4x - 2$$

$$\boxed{x = -2}$$

c) $2^{3x+1} = 32$

$$2^{3x+1} = 2^5$$

$$3x+1 = 5$$

$$3x = 4$$

$$\boxed{x = \frac{4}{3}}$$

d) $5^{2x} = 25^{2x-1}$

$$5^{2x} = 5^{2(2x-1)}$$

$$2x = 2(2x-1)$$

$$2x = 4x - 2$$

$$-2x = -2$$

$$\boxed{x = 1}$$