Solving Percent Problems with a Proportion:

$$\frac{\%}{100} = \frac{\text{part}}{\text{total}}$$

or

$$\frac{\%}{100} = \frac{\text{is}}{\text{of}}$$

Using a percent equation:

(percent as a decimal) x (total) = part

$$\text{=} \rightarrow \text{is}$$

1. 5% of 48 is what?

$$\frac{5}{100} = \frac{x}{48}$$

$x = 2.4$

2. 120 is what percent of 105?

$$\frac{x}{100} = \frac{120}{105}$$

$x = 114.2\%$

3. 72 is 32% of what?

$$\frac{32}{100} = \frac{72}{x}$$

$x = 225$

Final Amt - Orig Amt

$$\text{Percent Change} = \frac{\text{Amount of Change}}{\text{Original Amount}} \times 100$$

4. The price of a gallon of gas last month was \$3.20. This month the price is \$3.62. Find the percent increase.

3.62 - 3.20

$$\frac{.42}{3.20} \times 100$$

13.13%

5. In 1990 the population of Detroit was 1,027,974. The population fell to 951,270 in 2000. Find the percent decrease.

$$\frac{951{,}270 - 1{,}027{,}974}{1{,}027{,}974} \times 100 = -7.46\%$$

6. The price of a TV was $480. The price went on sale at 30% off. Find the new price.

480(.30) = 144

480 − 144 = $336 or .70(480) = 336

7. The value of a house was $195,000. The value increased 8.4%. Find the new value of the house.

195,000(1.084) = 211,380

100% + 8.4% = 108.4%

What could you multiply a number by to find out the result of increasing it by 7%?

100% + 7%

107% → (1.07)

What could you multipy a number by to find out the result of decreasing it by 15%?

100% - 15%

85% → (.85)

8. The population of a city in 1950 was 12,000. The population increased 2% each year. Find the population of the city in 1960.

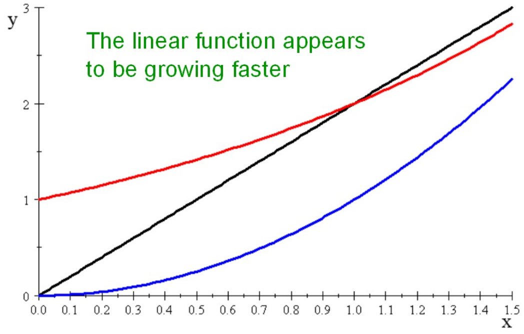
Year	Population
1950	12,000
1951	12,000 + 12,000(.02) = 12,000(1.02) =
1952	12,000(1.02)(1.02) =
1953	12,000(1.02)(1.02)(1.02) =
1954	12,000(1.02)(1.02)(1.02)(1.02) =
1955	12,000(1.02)(1.02)(1.02)(1.02)(1.02) =

$$y = 12{,}000(1.02)^x$$ =14,628 when x=10

This is an exponential equation

Which of the following graphs grows faster?

Linear Function	Power Function (squaring)	Exponential Function
1. $y = 2x$	2. $y = x^2$	3. $y = 2^x$



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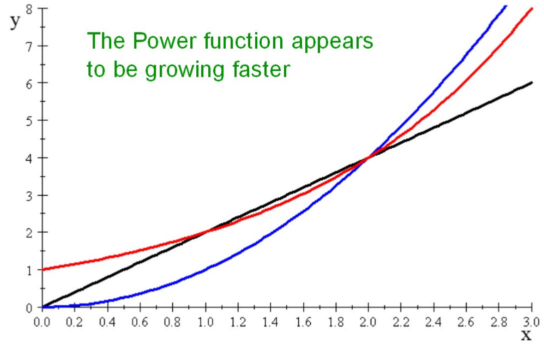

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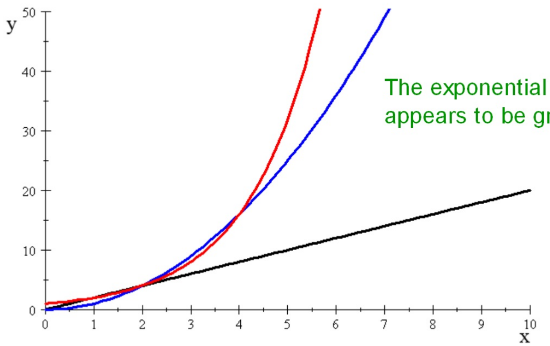


An exponential function will always overtake a linear and a power function...at some point.

Sec 8-1: Exponential Functions

Notes $y = a \cdot b^x$

Real Life meaning:

Values of a: $a \neq 0$ ⟶ Initial Amount

Values of b: $b > 0$ ⟶ Growth/Decay Factor

Values of x: real number ⟶ # of time periods

Use the following window:

$X_{min} = -5$ $X_{max} = 5$ $Y_{min} = -5$ $Y_{max} = 10$

Graph the equation: $Y_1 = b^x$ for different positive values of b

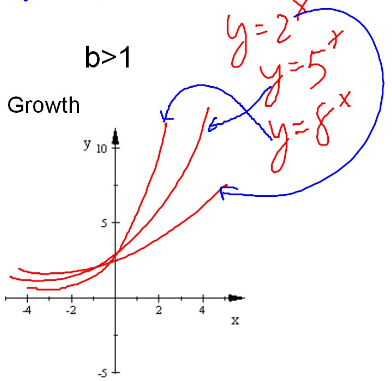
Write down each equation and make a quick sketch of it's graph.

You should have noticed two basic shapes depending on the value of b.

Describe these two shapes and for what values of b they occur.

b>1

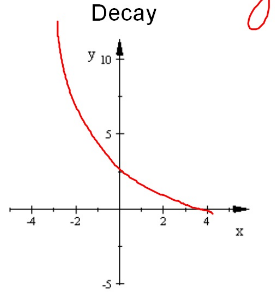
Growth



0<b<1

Decay

$y=.5^x$



Finish each sentence:

The larger the value of the base, the faster the graph grows.

The closer the base is to zero, the faster the graph decays.

The closer the base is to one, the flatter the graph is. If b=1 the graph is constant (a horizontal line).

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

Exponential Growth: Value of b: $b > 1$

b is called the growth factor

Exponential Decay: Value of b: $0 < b < 1$

b is called the decay factor

An investment was worth $15,000. The value of the investment increased by 8%. What equation will model this situation?

100% + 8%

$\downarrow$

108%

$y = 15000(1.08)^x$

A house was worth $284,000. The value of the house decreased by 13%. What equation will model this situation?

100% − 13%

= 87%

$y = 284{,}000(.87)^x$

Finding the growth/decay factor.

1. The population grows 4.5% per year.

   b= 1.045

   100% + 4.5%

   = 104.5%

2. The value of the car depreciates 18% per year.

   b= .82

3. The number of cells doubles every 40 minutes.

   b= 2

4. The half-life of a radioactive material is 2 hrs.

   b= .5