Friday, February 1, 2013

Agenda:

- TISK & 2 MM
- Lesson 12-6 part 2
- Homework: Finish 12-6 problems

TISK

1) Evaluate: $-6+12-18(-8+8)-7$
2) Write the equation of a line that passes through the points (7, 9) and (5, -5).
3) Write and solve a proportion: Seventy is what percent of 40?

§12-6 Exponential Functions

- What types of situations use exponential functions?
  - Exponential Growth
    - Exponential growth is when one amount grows very large, very fast.
      - Population growth
      - Cell Phone users from 1990 to now
    - In exponential growth, the value of *a* must be greater than 1
  - Exponential Decay
    - Exponential decay is when one amount decreases rapidly
      - Radioactive decay of materials (Half-lives)
      - Competition brackets
    - In exponential decay, the value of *a* must be less than 1.

§12-6 Exponential Functions

- A competition starts with 512 teams competing. Every round, two teams play against each other and one is eliminated.
  - After 3 rounds, how many teams are left?
  - Exponential Decay!
  - p = starting amount
    - $p = 512$
  - a = rate of decay
    - $a = \frac{1}{2}$
  - x = variable
    - x = number of rounds

$$f(x) = 512\left(\frac{1}{2}\right)^x$$

$$f(3) = 512\left(\frac{1}{2}\right)^3$$

$$f(3) = 512\left(\frac{1}{8}\right)$$

$$f(3) = 64$$

§12-6 Exponential Functions

- Bohrium-267 has a *half-life* of 15 seconds.
  - Find the percent of a sample after 2 minutes.
  - Exponential Decay!
  - p = starting amount
    - p = 100%
  - a = rate of decay
    - $a = \frac{1}{2}$
  - x = variable
    - x = number of decay-cycles

$$f(x) = 100\%\left(\frac{1}{2}\right)^x$$
$$f(8) = 100\%\left(\frac{1}{2}\right)^8$$
$$f(8) = 100\%\left(\frac{1}{256}\right)$$
$$f(8) \approx .39\%$$

§12-6 Exponential Functions

- A bacterial culture contains 5000 bacteria. The number of bacteria quadruples each day.
  - How many bacteria will be in the culture after a week?
  - Exponential Growth!
  - p = starting amount
    - p = 5,000
  - a = rate of growth
    - a = 4
  - x = variable
    - x = number of growth-cycles

$$f(x) = 5000(4)^x$$
$$f(7) = 5000(4)^7$$
$$f(7) = 5000(16384)$$
$$f(7) = 81{,}920{,}000$$

§12-6 Exponential Functions

- The number of Americans over 100 was about 70,000 in 2000. Say the population of Americans over 100 doubles each decade.
  - Estimate the population of Americans over 100 in the year 2095.
  - Exponential Growth!
  - p = starting amount
    - p = 70,000
  - a = rate of growth
    - a = 2
  - x = variable
    - x = number of growth-cycles

$$f(x) = 70{,}000(2)^x$$
$$f(9) = 70000(2)^9$$
$$f(9) = 70000(512)$$
$$f(9) = 35{,}840{,}000$$
$$f(10) = 70000(2)^{10}$$
$$f(10) = 70000(1024)$$
$$f(10) = 71{,}680{,}000$$

There would be between 35,840,000 and 71,680,000 Americans over 100 in 2095.

§12-6 Exponential Functions

- For each exponential function, find $f(-5), f(0)$, and $f(5)$.
- $f(x) = 0.3^x$

$f(-5) = (0.3)^{-5}$

$f(-5) = \left(\frac{10}{3}\right)\left(\frac{10}{3}\right)\left(\frac{10}{3}\right)\left(\frac{10}{3}\right)\left(\frac{10}{3}\right)$

$\boxed{f(-5) = \frac{100{,}000}{243}}$

$f(0) = 0.3^0$

$\boxed{f(0) = 1}$

$f(5) = 0.3^5$ $\boxed{f(5) = \frac{243}{100{,}000}}$

- $f(x) = 10^x$

$f(-5) = (10)^{-5}$

$f(-5) = \left(\frac{1}{10}\right)^5$

$\boxed{f(-5) = \frac{1}{100{,}000}}$

$f(0) = 10^0$

$\boxed{f(0) = 1}$

$f(5) = 10^5$

$\boxed{f(5) = 100{,}000}$