Today's Plan:

Learning Target (standard): I will solve real-world exponential growth and decay problems and review logarithmic and exponential functions.

Students will: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make necessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

Teacher will: Provide practice problems over previous concepts, check homework problems for accuracy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

Assessment: Board work, homework check and homework assignment

Differentiation: Students will work at the board, go over and correct homework at their seats, actively engage in lecture over new concepts, practice new concepts with the aid of other students and the teacher and complete homework assignment.

Please make sure to submit your homework in our Google Classroom assignment before class begins.

Strontium - 90 is a radioactive material that decays according to the equation $A = A_0e^{-.0244t}$ where time is in years. What is the half-life of strontium - 90? Determine how long it takes for 100 grams of it to decay to 10 grams.

a) $A = A_0e^{-.0244t}$

$\frac{1}{2}A_0 = A_0e^{-.0244t}$

$\frac{1}{2} = e^{-.0244t}$

$\ln(\frac{1}{2}) = \ln e^{-.0244t}$

$\ln(\frac{1}{2}) = -.0244t \ln e$

$t = \frac{\ln(\frac{1}{2})}{-.0244}$

$t = 28.408$ yrs

b) $10 = 100e^{-.0244t}$

$\frac{1}{10} = e^{-.0244t}$

$\ln(\frac{1}{10}) = \ln e^{-.0244t}$

$\ln(\frac{1}{10}) = -.0244t \ln e$

$t = \frac{\ln(\frac{1}{10})}{-.0244t}$

$t = 94.368$ yrs

The population of a colony of mosquitoes obeys the law of uninhibited growth. If there are 1000 mosquitoes initially and there 1800 after 1 day, what is the size of the colony after 3 days? How long is it until there are 10,000 mosquitoes?

a) $A = A_0e^{kt}$

$1800 = 1000e^{1k}$

$1.8 = e^k$

$\ln(1.8) = \ln e^k$

$\ln(1.8) = k \ln e$

$k = .587786665$

b) $A = A_0e^{.587786665t}$

$A = 1000e^{.587786665(3)}$

$A = 1000e^{1.763359995}$

$= 1000(5.832)$

$A = 5832$ mosquitoes

c) $10000 = 1000e^{.587786665t}$

$10 = e^{.587786665t}$

$\ln 10 = \ln e^{.587786665t}$

$\ln 10 = .587786665t \ln e$

$t = \frac{\ln 10}{.587786665}$

$t = 3.917$ days

The population of a southern city follows an exponential model. If the population doubled in size over an 18-month period and the current population is 10,000, what will the population be 2 years from now?

24mo

a) $A = A_0 e^{kt}$

$2A_0 = A_0 e^{18k}$

$2 = e^{18k}$

$\ln 2 = \ln e^{18k}$

$\ln 2 = 18k \ln e$

$k = \frac{\ln 2}{18}$

$k = .038508177$

b) $A = A_0 e^{.038508177}$

$A = 10000 e^{.038508177(24)}$

$= 10000 e^{.924196241}$

$= 10000(2.5198421)$

$A = 25198.421$

$A = 25199$ people

Find the inverse. Verify. Find the domain and range of each.

$f(x) = \frac{2x+3}{5x-2}$ 1-1 ✓

D: $\{x \mid x \neq \frac{2}{5}\}$

R: $\{y \mid y \neq \frac{2}{5}\}$

$y = \frac{2x+3}{5x-2}$

$x = \frac{2y+3}{5y-2}$

$5xy - 2x = 2y + 3$

$5xy - 2y = 2x + 3$

$y(5x-2) = 2x+3$

$y = \frac{2x+3}{5x-2}$

$f^{-1}(x) = \frac{2x+3}{5x-2}$

D: $\{x \mid x \neq \frac{2}{5}\}$

R: $\{y \mid y \neq \frac{2}{5}\}$

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

$= \frac{\frac{4x+6}{5x-2} + \frac{15x-6}{5x-2}}{\frac{10x+15}{5x-2} + \frac{-10x+4}{5x-2}}$

$= \frac{\frac{19x}{5x-2}}{\frac{19}{5x-2}} = \frac{19x}{5x-2} \cdot \frac{5x-2}{19}$

$f(f^{-1}(x)) = x$

$f^{-1}(f(x)) = f(f^{-1}(x))$

$\therefore$ Since $f(f^{-1}(x)) = x$ and $f^{-1}(f(x)) = x$, they are inverses

Graph. Find the domain, range, and intercepts.

$$f(x) = -\frac{1}{2}\cdot 3^{-\frac{1}{2}x+2} + 3$$

parents: $f(x) = 3^x$ HA: $y=0$

1) $f(x) = -3^x$ r_x

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

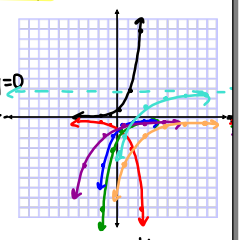
3) $f(x) = -\frac{1}{2}\cdot 3^{-x}$ v.c. by $\frac{1}{2}$

4) $f(x) = -\frac{1}{2}\cdot 3^{-\frac{1}{2}x}$ h.s. by 2

5) $f(x) = -\frac{1}{2}\cdot 3^{-\frac{1}{2}(x-4)}$ shift right 4

6) $f(x) = -\frac{1}{2}\cdot 3^{-\frac{1}{2}x+2} + 3$ shift up 3

HA: $y=3$



x	y
-2	$\frac{1}{2}$
-1	$\frac{1}{6}$
0	1
1	3
2	9

D: $\mathbb{R}$

R: $\{y \mid y < 3\}$

I_x: $(0.738, 0)$

$0 = -\frac{1}{2}\cdot 3^{-\frac{1}{2}x+2} + 3$

$-3 = -\frac{1}{2}\cdot 3^{-\frac{1}{2}x+2}$

$6 = 3^{-\frac{1}{2}x+2}$

$\ln 6 = \ln 3^{-\frac{1}{2}x+2}$

$\ln 6 = (-\frac{1}{2}x+2)\ln 3$

$\frac{\ln 6}{\ln 3} = -\frac{1}{2}x+2$

$1.63093 = -\frac{1}{2}x+2$

$-0.36907 = -\frac{1}{2}x$

$x = 0.738$

I_y: $(0, -\frac{3}{2})$

$y = -\frac{1}{2}\cdot 3^2 + 3$

$y = -\frac{1}{2}(9) + 3$

$y = -\frac{9}{2} + \frac{6}{2}$

$y = -\frac{3}{2}$

Write as a single logarithm.

$$\frac{2}{3}\log(x-3) + \frac{1}{6}\log(2x-5) - 5\log 100 - 4\log(3x-2)$$

$$= \log(x-3)^{\frac{2}{3}} + \log(2x-5)^{\frac{1}{6}} - 5(2) - \log(3x-2)^4$$

$$= \log(x-3)^{\frac{2}{3}}(2x-5)^{\frac{1}{6}} - \log(3x-2)^4 - 10$$

$$= \log\left[\frac{(x-3)^{\frac{2}{3}}(2x-5)^{\frac{1}{6}}}{(3x-2)^4}\right] - 10$$

$$= \log\left[\frac{(x-3)^{\frac{4}{6}}(2x-5)^{\frac{1}{6}}}{(3x-2)^4}\right] - 10$$

$$= \log\left[\frac{\sqrt[6]{(x-3)^4(2x-5)}}{(3x-2)^4}\right] - 10$$

Assignment:

Logarithmic Review

#1-19 (exact values on ALL)

* TEST will be Monday *