3.1-3.3 Review WS KEY

Sunday, November 23, 2014   4:46 PM

Precalculus
Review HW – Section 3.1-3.3

Name: *Key*

Directions: Answer each question without a calculator, unless otherwise specified.

1) Determine if each function is exponential. If exponential, identify a, b and whether it represents growth or decay.

   a) $f(x) = x^{1.2}$

   not exponential

   c) $f(x) = 4 \cdot \left(\dfrac{2}{3}\right)^x$

   Decay!

   $a = 4 \quad b = 2/3$

   b) $f(x) = \left(\dfrac{1}{3}\right)^{-x} = 3^x$

   growth!

   $a = 1 \quad b = 3$

   d) $f(x) = 2 \cdot (0.88)^x$

   decay!

   $a = 2 \quad b = 0.88$

2) Find an exponential equation for a function whose graph contains the points (0, 4) and (5, 600).
   You may use your calculator to help you compute the "b" value, but you must show algebraic work to support your solution.

   $y = a \cdot b^x$
   $600 = 4 \cdot b^5$
   $b = 2.72$

   $\boxed{y = 4(2.72)^x}$

3) Evaluate the function $f(x) = -2 \bullet 8^x$:   No calculator!

   a) when $x = 0$ $-2 \cdot 8^0$
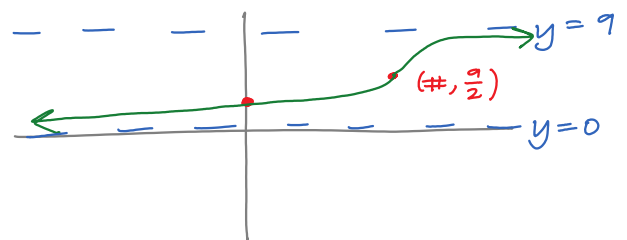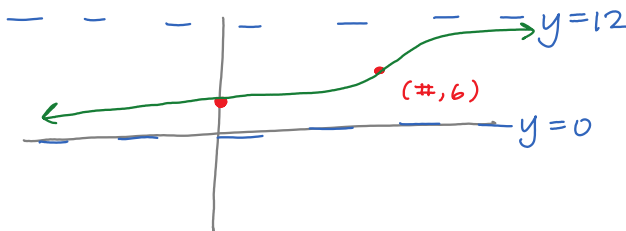 $-2 \cdot 1$
      $\boxed{-2}$

   b) when $x = -1$ $-2 \cdot \dfrac{1}{8} = \boxed{-\dfrac{1}{4}}$

   c) when $x = \dfrac{2}{3}$ $-2 \cdot \sqrt[3]{8^2}$
      $-2 \cdot 2^2$
      $-2 \cdot 4$
      $\boxed{-8}$

4) Find the y-intercept, limit to growth, horizontal asymptotes and the y-coordinate of symmetry for the following functions: No calculator!

   a) $f(x) = \dfrac{12}{1 + 3(0.2)^x}$
      y-int
      (0, 4)
      c = 12

   b) $f(x) = \dfrac{9}{3 + 2e^{-x}}$
      y-int
      $\left(0, \dfrac{9}{5}\right)$
      c = 9

5)   a) Write an exponential equation using the following information:
         Initial Value: $1000
         % increase: 2.4% per year

$$y = 1000(1 + .024)^x$$

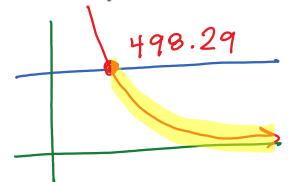   b) When will the value be equal to $1200? (Calculators ok!)

$$\underbrace{1200}_{Y_1} = \underbrace{1000(1.024)^x}_{Y_2}$$

$$\boxed{\approx 7.69 \text{ years}}$$

6) The half-life of a certain radioactive substance is <u>150 days</u>. If the initial amount of the substance is <u>100 g</u>, determine when there will be less than <u>10 grams left</u>. Write the equation and then use your calculator to help solve.

$$y = 100\left(\tfrac{1}{2}\right)^{x/150}$$

$$\underbrace{10}_{Y_1} > \underbrace{100\left(\tfrac{1}{2}\right)^{x/150}}_{Y_2}$$

498.29

$$\boxed{\text{after } 498.29 \text{ years}}$$

7) Write a logistic function given the following information (Calc okay, round to the nearest hundredth):

$$y = \frac{c}{1 + a \cdot b^x}$$

initial value = 10   limit to growth = 40   point at (3, 17.5)
$(0, 10)$ $c = 40$

$$10 = \frac{40}{1 + a \cdot b^0}$$
$$10 + 10a = 40 \Rightarrow a = 3$$

$$17.5 = \frac{40}{1 + 3b^3}$$
$$17.5(1 + 3b^3) = 40$$
$$b^3 = .43 \Rightarrow b = .75$$

$$\boxed{y = \frac{40}{1 + 3(.75)^x}}$$

8) Evaluate (without a calculator):

   a. $\log_2 16$
$$2^x = 16$$
$$\boxed{4}$$

   b. $\log 0.01$
$$10^x = \tfrac{1}{100}$$
$$\boxed{-2}$$

   c. $\ln e$
$$e^x = e$$
$$\boxed{1}$$

   d. $\ln 1$
$$e^x = 1$$
$$\boxed{0}$$

   e. $\log_{\frac{1}{2}} 8$
$$\tfrac{1}{2}^x = 8$$
$$\boxed{-3}$$

   f. $\log \dfrac{1}{\sqrt{1000}}$
$$10^x = 1000^{-1/2}$$
$$10^x = (10^3)^{-1/2}$$
$$\boxed{-3/2}$$

9) Evaluate the following *with* a calculator:

   a. $\log 217$
$$2.34$$

   b. $\log(-15)$
$$\varnothing$$

   c. $\ln(0.345)$
$$-1.06$$

10) Describe how to transform the graph $f(x) = \ln x$ into the graph $g(x) = -\dfrac{1}{2}\ln(4x - 1) + 3$.

these can be FLIPPED (both Multiplication)

vertical
① flip over x-axis
② shrink bafo 2
③ ↑3

horizontal
① → 1
② shrink bafo 4