Pre-Calc Review HW – Section 3.1-3.3 Name DiMarco

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

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

a) $f(x) = x^{1.2}$ Not exp.

b) $f(x) = \left(\frac{1}{3}\right)^{-x} = 3^x$ Exp. Growth
$a=1$
$b=3$ $r=2$

c) $f(x) = 4\cdot\left(\frac{2}{3}\right)^x$ Exp. Decay
$a=4$
$b=2/3$
rate of Decay $r=\frac{1}{3}$

d) $f(x) = 2\cdot(0.88)^x$ Exp Decay
$a=2$
$b=.88$ $r=.12$

2) Find an exponential equation for a function whose graph contains the points (0, 4) and (5, 600.25). (You may use your calculator to help you compute the "b" value, but you must ~~show algebraic work~~ to support your solution.)

$\boxed{y=a\cdot b^x}$ memorize

$600.25 = 4\cdot b^5$

$150.0625 = b^5$ $b=2.724$

$\boxed{f(x)=4\cdot 2.724^x}$

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

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

b) when $x=-1$ $f(-1) = -2\cdot 8^{-1} = \frac{-2}{8} = \boxed{-\frac{1}{4}}$

c) when $x=\frac{2}{3}$ $f(\frac{2}{3}) = -2\cdot 8^{\frac{2}{3}}$
$= -2\sqrt[3]{8^2}$
$= -2\cdot 2^2$
$= \boxed{-8}$

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

a) $f(x) = \frac{12}{1+3(0.2)^x}$ y-int $(0,3)$ when $x=0$
$f(0) = \frac{12}{1+3(1)} = \frac{12}{4} = 3$
limit $= 12$
H.A. $y=0, y=12$

b) $f(x) = \frac{9}{1+2e^{-x}}$ y-int $(0,3)$
$f(0) = \frac{9}{1+2e^0} = \frac{9}{1+2} = 3$ limit $= 9$
HA $y=0, y=9$

5) Write an exponential equation using the following information:
Initial Value: $1000
% increase: 2.4% per year $r=.024$ Growth
$A(t) = 1000(1.024)^t$

When will the value be equal to $1200? (Calculators ok!) $1200 = 1000(1.024)^t$
$1.2 = 1.024^t$
$t = \frac{\log 1.2}{\log 1.024} \approx \boxed{7.688 \text{ years}}$

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

$A(t) = 100\left(\frac{1}{2}\right)^{t/150}$

$10 = 100\left(\frac{1}{2}\right)^{t/150}$

$\frac{1}{10} = \left(\frac{1}{2}\right)^{t/150}$

$\frac{t}{150} = \frac{\log \frac{1}{10}}{\log \frac{1}{2}}$ $\quad t \approx 498.3$ $\quad \boxed{\text{after } 498.3 \text{ days}}$

7) Evaluate without using a calculator: (remember to rewrite as an exponential equation…)

$\ln \frac{1}{e} =$ <u>-1</u> $\quad e^{\square} = \frac{1}{e}$

$\cancel{e}^{\ln 8} =$ <u>8</u>

$\ln \sqrt[4]{e} =$ <u>$\frac{1}{4}$</u> $\quad e^x = \sqrt[4]{e}$

$\log_5 \sqrt{125} =$ <u>$\frac{3}{2}$</u> $\quad 5^x = \sqrt{125} \quad 5^x = 5^{3/2}$

$\log_7 \sqrt[3]{7} =$ <u>$\frac{1}{3}$</u> $\quad 7^x = \sqrt[3]{7} \quad 7^x = 7^{1/3}$

$\log \frac{1}{1000} =$ <u>-3</u> $\quad 10^x = 10^{-3}$

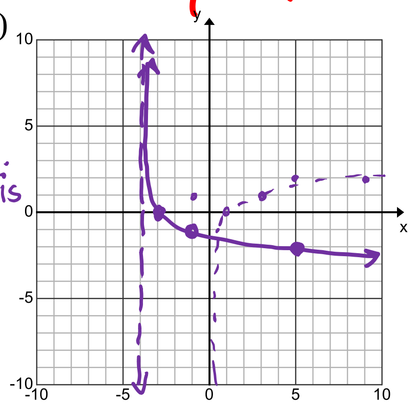
8) Graph $y = -\log_3(x+4)$

$y = \log_3 x$

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

*shift left 4

* vert refl. over x-axis



9) Given a logistic function with initial value of 10, limit to growth of 40, and a point at (3, 17.5), find the equation for the logistic function. Round to the nearest hundredth.

$(0, 10)$

$c = 40$

① $10 = \frac{40}{1 + a \cdot b^0}$

$10 + 10a = 40$

$10a = 30$

$a = 3$

$(3, 17.5)$

② $17.5 = \frac{40}{1 + 3 \cdot b^3}$

$17.5 + 52.5b^3 = 40$

$52.5b^3 = 22.5$

$b^3 = .429$

$b \approx .75$

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

Remember – You have a quiz (3.1-3.3) tomorrow! Check your answers on weebly!