AFM

Module 4 & 9 Test Review

Name: ______________________

Date: ______________________ Pd: ________

1. Find the value of x when $y = 100$ in the following equation: $y = 12(3.7)^x$

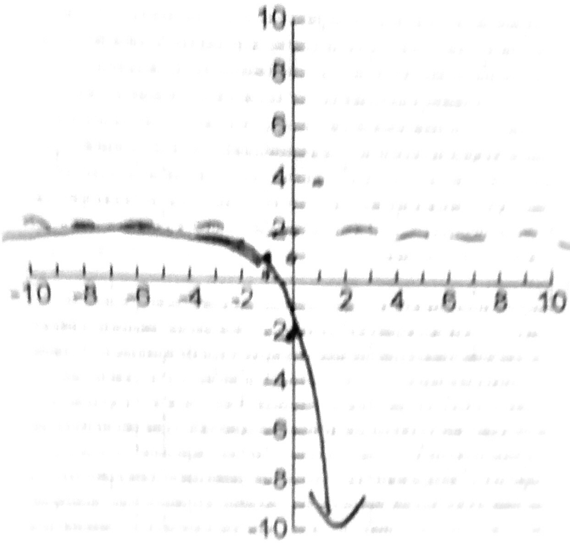
   $100 = 12(3.7)^x$ $\log_{3.7} 25/3 = x$

   $25/3 = 3.7^x$ $x = 1.62$

2. Sketch the graphs of the following functions. State the domain, range, and asymptote of the function.

   Refl x-axis, left 1, up 2

   a. $f(x) = 2 - (4)^{x+1}$

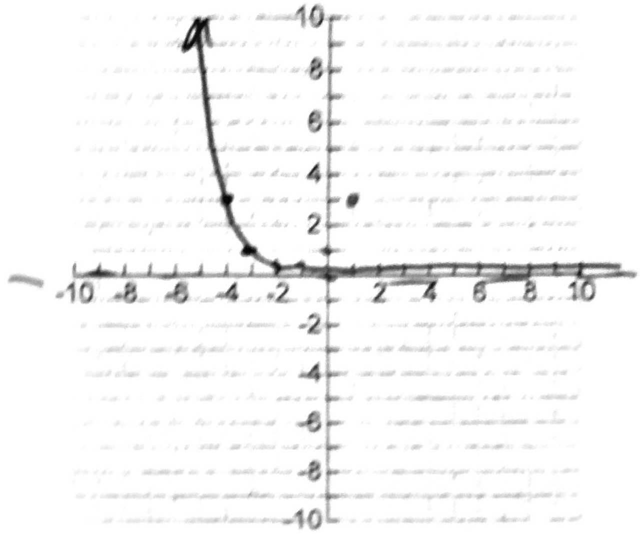


Domain: $x \mid x = \mathbb{R}$

Range: $y \mid y < 2$

Asymptote: $y = 2$

   b. $f(x) = 3^{-x-3} = 3^{-(x+3)}$ Refl y, left 3



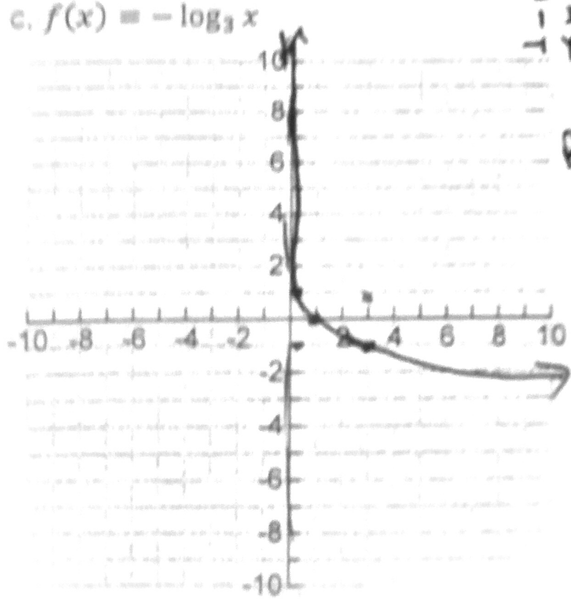
Domain: $x \mid x = \mathbb{R}$

Range: $y \mid y > 0$

Asymptote: $y = 0$

   c. $f(x) = -\log_3 x$

   Refl x



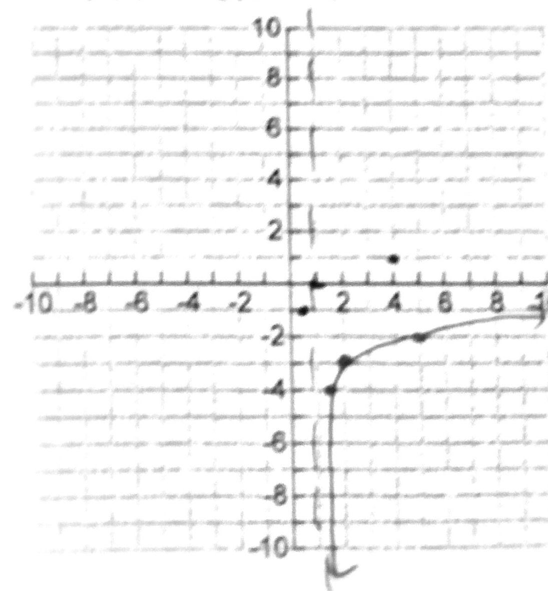
Domain: $x \mid x > 0$

Range: $y \mid y = \mathbb{R}$

Asymptote: $x = 0$

   d. $f(x) = \log_4(x - 1) - 3$

   Rt 1, down 3



Domain: $x \mid x > 1$

Range: $y \mid y = \mathbb{R}$

Asymptote: $x = 1$

3. Given the following function, $y = 1 + e^{x-1}$, state the domain, range and asymptote.

Domain: $x \mid x \in \mathbb{R}$

Range: $y \mid y > 0$

Asymptote: $y = 1$

4. The number of bacteria in a culture is given by the formula $n(t)n(t) = 1200e^{0.35t}$, where "t" is measured in hours.

a. What is the relative rate of growth of this bacterial population? 35%

b. What is the initial population of the culture? 1200

c. How many bacteria will the culture contain after 3 hours?

$1200e^{.35 \cdot 3} \approx 3429.18$

d. How long will it take the bacteria to reach a population of 10,500?

$1200e^{.35t} = 10500$

$e^{.35t} = 8.75$

$\ln 8.75 = .35t$

$t = 6.20$ hrs

5. The following data below represents the amount of money an investor has in an investment account each year for 10 years. She wishes to determine the effective rate of return on her investment.

	0	1	2	3	4	5	6	7	8	9
Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Value of Account	$10,000	$10,573	$11,260	$11,733	$12,242	$13,269	$13,969	$14,823	$15,297	$16,539

a. Find an exponential model for this data.

$9995.72(1.06)^x$

b. If the investor plans to retire in 2020, what will the predicted value of this account be?

$2020 - 1985 = 35$

$9995.72(1.06)^{35} = 76827.97$

6. Express the following equations in exponential form:

a. $\log_6 1 = 0$

$6^0 = 1$

b. $\log_{27} 9 = \frac{4}{3}$

$27^{4/3} = 9$

c. $\log_2 M = \pi$

$2^\pi = M$

d. $\ln x = 4$

$e^4 = x$

e. $\ln 4 = x$

$e^x = 4$

7. Express the following equations in logarithmic form:

a. $16^{(\frac{1}{2})} = 4$

$\log_{16} 4 = \frac{1}{2}$

b. $10^5 = 100{,}000$

$\log 100{,}000 = 5$

c. $5^{-1} = \frac{1}{5}$

$\log_5 1/5 = -1$

d. $e^5 = x$

$\ln x = 5$

e. $10^m = n$

$\log n = m$

8. Evaluate the expression $\log_8 16 = x$

$8^x = 16$

$2^{3x} = 2^4$

$3x = 4$

$x = 4/3$

9. Rewrite the expressions as single logarithms.

a. $\log_4(x^2 - 1) - \log_4(x - 1)$

$\log_4 \frac{x^2-1}{x-1}$

b. $\frac{1}{3}(\log_4 x + 3\log_4 y - 2\log_4 z)$

$\frac{1}{3}\left(\log_4 \frac{xy^3}{z^2}\right) = \log_4 \left(\sqrt[3]{\frac{xy^3}{z^2}}\right)$

10. Use the Law of Logarithms to rewrite the expressions in a form with no logarithms of produ quotients, or powers.

a. $\log_3(\frac{x}{4})$

$\log_3 x - \log_3 4$

b. $\log_6 \sqrt[5]{13}$

$\frac{1}{5}\log_6 13$

c. $\log_a(xy)^7$

$7\log xy$

$7(\log_a x + \log_a y)$

$7\log_a x + 7\log_a y$

d. $\log_4 \sqrt{\frac{(x+2)}{x}}$

$\frac{1}{2}\log_4 \frac{x+2}{x}$

$\frac{1}{2}(\log_4 (x+2) - \log_4 x)$

$\log_4 \sqrt{x+2} - \log_4 \sqrt{x}$

e. $\ln \sqrt{b^2 d^5}$

$\ln bd^{5/2}$

$\ln b + \ln d^{5/2}$

$\ln b + \frac{5}{2}\ln d$

f. $\log_4(\frac{\sqrt{k}}{m^2})$

$\log_4 \sqrt{k} - \log_4 m^2$

$\frac{1}{2}\log_4 k - 2\log_4 m$

11. Find the solution to four decimal places

a. $8^{1-x} = 5$

$\log_8 5 = 1 - x$

$-.7740 = 1 - x$

$-.226 = -x$

$x = .226$

b. $e^{5-2x} = 8$

$\ln 8 = 5 - 2x$

$2.0794 = 5 - 2x$

$-2.9206 = -2x$

$x = 1.4603$

12. If $4,000 is borrowed at a rate of 14% interest per year, compounded daily, find the amount due at the end of 4 years.

$$4000\left(1+\frac{.14}{365}\right)^{365\cdot 4} = 7001.94$$

13. Vince wants to invest $3,000 in savings certificates that bear an interest rate of 8.25% compounded semiannually. How long a time period should she choose in order to save an amount of $5,000?

$$3000\left(1+\frac{.0825}{2}\right)^{2t} = 5000$$

$$1.04125^{2t} = 5/3$$

$$\log_{1.04125} 5/3 = 2t$$

$$12.637 = 2t$$

$$6.32 = t$$

14. A culture starts with 680 bacteria. After just 30 minutes the count is 3250.

a. Find a formula for the number of bacteria after "t" hours.

$$680(x)^{.5} = 3250$$

$$x^{.5} = \frac{325}{68} = 22.84278$$

$$680(22.84278)^t$$

b. Find the number of bacteria after 3.5 hours.

$$680(22.84278)^{3.5} \rightarrow 680(22.8728)^{3.5} = 38915855$$

c. After how many hours will the number of bacteria be triple?

$$680(22.8428)^t = 2040$$

$$22.8428^t = 3$$

$$\log_{22.8428} 3 = t$$

$$.35 \text{ hrs} = t$$