

**MATH 120  
REVIEW #4**

**Graph the exponential function. Be sure to state the y intercept and horizontal asymptote.**

1.  $f(x) = 5^{x-2} + 4$

2.  $f(x) = e^{-x+2}$

**Find the x-intercept, vertical asymptote, and domain of the function. Then graph the logarithmic equation.**

3.  $f(x) = \ln x + 3$

4.  $f(x) = \log(x-3) + 1$

**Use the properties of logarithms to expand the expressions as a sum, difference, and/or multiple of logarithms.**

5.  $\log_5 5x^2$

6.  $\log \frac{\sqrt{x}}{y}$

7.  $\ln x^2 y^2 z^3$

**Condense the expression to a single logarithm.**

8.  $3\ln x + 2\ln(x+1)$

9.  $-2\log x - 5\log(x+6)$

10.  $5\ln(x-2) - \ln(x+2) - 3\ln x$

**Solve for x. Answers may be left as exact or to 4 decimal places.**

11.  $8^x = 512$

12.  $6^x - 28 = -8$

13.  $2^x + 13 = 35$

14.  $14e^{3x+2} = 560$

15.  $\ln x = 4$

16.  $\ln 3x = 8.2$

17.  $\ln \sqrt{x+1} = 2$

18.  $\ln x - \ln 5 = 4$

19.  $\log(x-1) = \log(x-2) - \log(x+2)$

20.  $\log(1-x) = -1$

**Determine whether the equation is true or false. Justify your answer.**

21.  $\log_b b^{2x} = 2x$

22.  $\ln(x + y) = \ln x + \ln y$

**Solve.**

23. You noticed a billboard indicating that it is 2.5 miles or 4 kilometers to the next restaurant. Use this information to find a linear model that relates miles to kilometers. Use the model to find the number of kilometers in 2 miles and 10 miles.

24. The frictional force  $F$  between the tires and the road required to keep a car on a curved section of a highway is directly proportional to the square of the speed  $s$  of the car. If the speed of the car is doubled, the force will change by what factor?

25. After discontinuing all advertising for a tool kit in 1998, the manufacturer notes that sales began to drop according to the model

$$S = \frac{500,000}{1 + 0.6e^{kt}}$$

Where  $S$  represents the number of units sold and  $t = 0$  represents 1998. In 2000, the company sold 300,000 units.

- a) Complete the model by solving for  $k$ .
- b) Estimate sales in 2005.

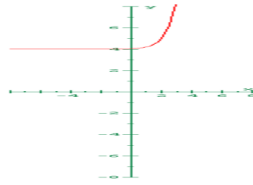
26. Determine the principal  $P$  that must be invested at an annual rate of 7% compounded continuously, so that \$500,000 will be available for retirement in 30 years.

27. Determine the time necessary for \$2,000 to double if it is invested at 10.5% and is compounded continuously.

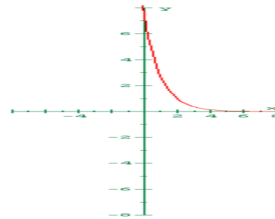
28. The population  $P$  of Charlotte, NC (in thousands) is  $P = 548e^{kt}$  where  $t = 0$  represents the year 2000. In 1970, the population was 241,000. Find the value of  $k$ , and use this result to predict the population in the year 2010.

#### ANSWERS TO REVIEW #4

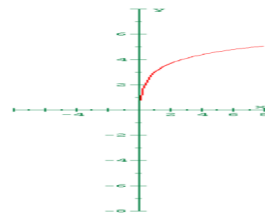
1. H.A.  $y = 4$  y intercept:  $\left(0, \frac{101}{25}\right)$



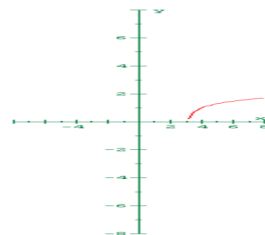
2. H.A.:  $y = 0$  y intercept:  $(0, 7.39)$



3. V.A.:  $x = 0$  Domain:  $(0, \infty)$  x intercept:  $(.05, 0)$



4. V.A.:  $x = 3$  Domain:  $(3, \infty)$  x intercept:  $(3.1, 0)$



5.  $1 + 2\log_5 x$
6.  $\frac{1}{2}\log x - \log y$
7.  $2\ln x + 2\ln y + 3\ln z$
8.  $\ln x^3(x+1)^2$
9.  $\log \frac{1}{x^2(x+6)^5}$
10.  $\ln \frac{(x-2)^5}{x^3(x+2)}$
11.  $x = 3$
12.  $x = 1.6720$
13.  $x = 4.4594$
14.  $x = .5630$
15.  $x = 54.598$
16.  $x = 1213.650$
17.  $x = 53.598$
18.  $x = 272.991$
19. No solution
20.  $x = \frac{9}{10}$  or 0.9
21. True
22. False
23. 2 miles = 3.2 km, 10 miles = 16 km
24. The force will change by a factor of 4.
25. a)  $k = .053$ , b)  $S = 267,809$
26.  $P = \$61,228.21$
27.  $T = 6.6$  years
28.  $k = .0274$ ,  $P = 720,738$