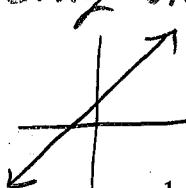


Review for test

1. Draw a sketch of a one-to-one function. Explain how you know it is one-to-one.

Your graph should only increase or decrease.

For each x there is only 1 y value and for each y value there is only one x value

Ex

OR



2. Find the $f^{-1}(x)$ if $f(x) = \frac{1}{x+2} + 3$

Switch $x+y$ solve for y

$$x = \frac{1}{y+2} + 3$$

$$y+2 = \frac{1}{x-3} \text{ Subtract 3}$$

$$x-3 = \frac{1}{y+2} \text{ mult. Both sides by } y+2$$

$$(x-3)(y+2) = 1$$

$$y+2 = \frac{1}{x-3} \text{ Divide Both sides by } x-3$$

$$y = \frac{1}{x-3} - 2 \text{ subtract 2}$$

$$f^{-1}(x) = \frac{1}{x-3} - 2 \text{ write in correct notation}$$

The following statements describe situations where functions relate two quantitative variables. For each situation:

- if possible, give a rule for the function that is described.
 - determine whether the given function has an inverse,
 - if an inverse exists, give a rule for that inverse function (if possible) and explain what it tells about the variables of the situation.
- b. If a school assigns 20 students to each mathematics class, the number of mathematics classes M is a function of the number of mathematics students s in that school.

$$M = \frac{s}{20}$$

Yes it has an inverse

$s = 20M$ The Number of students in the school is 20 times the Number of Math classes.

- 9 A vacuum pump attached to a chamber removes 5% of the gas in the chamber with each pump cycle.

- a. What function shows the percent of gas remaining in the chamber after n pump cycles?

$$g(n) = (95)^n$$

- b. How many full cycles are needed before at least 99% of the gas is removed?

$$.01 = (.95)^n$$

$$\log(.01) = n \log(.95)$$

$$\frac{\log(.01)}{\log(.95)} = n$$

$$n \approx 89.78$$

so 90 cycles to Remove at least 99% of the gas.

- 10 Use the facts that $\log 20 \approx 1.3$ and $\log 16 \approx 1.2$ and the properties of logarithms to find approximate decimal values for each of these logarithms—without the use of technology.

a. $\log 320$

$$16 \cdot 20 = 320$$

$$\log(16 \cdot 20) =$$

$$\log(16) + \log(20)$$

$$1.2 + 1.3 =$$

$$\boxed{2.5}$$

b. $\log 1.25$

$$\frac{20}{16} = 1.25$$

$$\log\left(\frac{20}{16}\right) =$$

$$\log(20) - \log(16)$$

$$1.3 - 1.2 =$$

$$\boxed{.1}$$

c. $\log 400$

$$20^2 = 400$$

$$\log(20^2) =$$

$$2 \log 20 =$$

$$2(1.3) =$$

$$\boxed{2.6}$$

2 Use properties of logarithms to write the following expressions in different equivalent forms.

a. $\log 3x$

$$\log 3 + \log x$$

b. $\log 5x^3$

$$\log 5 + 3 \log x$$

c. $\log\left(\frac{7x}{5y}\right)$

$$\log 7 + \log x - [\log 5 + \log y]$$

OR
 $\log 7 - \log x - \log 5 - \log y$

d. $\log\left(\frac{1}{3x}\right)$

$$\log 1 - [\log 3 + \log x]$$

OR

$$\log 1 - \log 3 - \log x$$

e. $\log 7 + \log x$

$$\log(7x)$$

f. $3 \log y$

$$\log(y^3)$$

g. $\log x - \log 3y$

$$\log\left(\frac{x}{3y}\right)$$

h. $\log 7x^3y^2$

$$\log 7 + 3 \log x + 2 \log y$$

i. $\log\left(\frac{7+x}{49-x^2}\right)$

$$\log(7+x) - \log(49-x^2)$$



3 Use what you know about logarithms to solve these equations without rewriting the exponential expressions in equivalent base 10 form.

I Rounded to 3 decimal places.

d. $5(2)^x + 7 = 42$

$$-7 \quad -7$$

$$\frac{5(2^x)}{5} = \frac{35}{5}$$

$$2^x = 7$$

$$x \log 2 = \log 7$$

$$x = \frac{\log 7}{\log 2}$$

$$x = 2.807$$

e. $\frac{5(3)^{x+1}}{5} = \frac{2,500}{5}$

$$3^{x+1} = 500$$

$$(x+1) \log 3 = \log 500$$

$$x+1 = \frac{\log 500}{\log 3} - 1$$

$$x = \frac{\log 500}{\log 3} - 1$$

$$x = 4.657$$

f. $1.8^{3x} = 75$

$$(3x) \log(1.8) = \frac{\log(75)}{3 \log 1.8}$$

$$x = \frac{\log(75)}{3 \log(1.8)}$$

$$x = 2.448$$

3. If $\log_{(x+1)} 27 = 3$, find the value of x .

use log definition

$$(x+1)^3 = 27$$

$$\sqrt[3]{(x+1)^3} = \sqrt[3]{27}$$

$$x+1 = 3$$

$$\begin{array}{r} -1 \\ -1 \\ \hline x = 2 \end{array}$$

4. Solve for x : $\log_8(x-6) + \log_8(x+6) = 2$

$$\log_8((x-6)(x+6)) = 2$$

$$8^2 = (x-6)(x+6)$$

$$\begin{array}{r} 64 = x^2 - 36 \\ +36 \qquad +36 \\ \hline 100 = x^2 \end{array}$$

$$\sqrt{100} = \sqrt{x^2}$$

$$\pm 10 = x$$

Cannot do log of a Negative so the answer is only 10

- 25 Suppose that n is a positive number.

- a. If $0 < \log n < 1$, what can you say about n ?

$$1 < n < 10$$

- b. If $5 < \log n < 6$, what can you say about n ?

$$10^5 < n < 10^6 \text{ or } 100,000 < n < 1,000,000$$

- c. If $p < \log n < p+1$, where p is a positive integer, what can you say about n ?

$$10^p < n < 10^{p+1}$$

5. The population of Nigeria at the beginning of 2008 was about 140 million and growing exponentially at a rate of about 2.4% per year. Write a function P(t) that will model this situation. Then find algebraically, when the population is predicted to reach 200 million.

$$P(t) = 140(1.024)^t$$

$$200 = 140(1.024)^t$$

$$\frac{200}{140} = (1.024)^t$$

$$\frac{\log\left(\frac{200}{140}\right)}{\log(1.024)} = \frac{t \cdot \log(1.024)}{\log(1.024)}$$

$$t = 15.039$$

Nigeria's Population
will Reach 200 mill.
during the Year
2023.

6. SIMPLIFY:

a.

$$\sqrt[3]{24x^2} \cdot \sqrt[3]{16x^7} = \sqrt[3]{384x^9} = \sqrt[3]{64^3 \cdot 6} \cdot x^3 = [4x^3 \cdot \sqrt[3]{6}]$$

b.

$$2\sqrt[3]{x^4} \cdot \sqrt[3]{125x^7} = 2\sqrt[3]{125x^{11}} = 2 \cdot 5 \sqrt[3]{x^9} \sqrt[3]{x^2} \\ = [10x^3 \cdot \sqrt[3]{x^2}]$$

c.

$$(4x^4y^{-8})^{\frac{1}{2}} = 4^{\frac{1}{2}} \cdot x^{\frac{4}{2}} \cdot y^{-\frac{8}{2}} = \left[\frac{2x^2}{y^4} \right]$$

7. What is the value of $4x^{\frac{1}{2}} + x^0 + x^{-\frac{1}{4}}$ when $x = 16$?

$$4(16)^{\frac{1}{2}} + (16)^0 + (16)^{-\frac{1}{4}}$$

$$4 \cdot 4 + 1 + .5$$

$$\boxed{17.5}$$

8. Solve for x : $16^{x+4} = 32^{2x-10}$

Make Both the Same base

$$16 = 2^4 \quad 32 = 2^5$$

$$2^{4(x+4)} = 2^{5(2x-10)}$$

$$4(x+4) = 5(2x-10)$$

$$4x + 16 = 10x - 50$$

$$\begin{matrix} -4x & +50 \\ \hline & +50 \end{matrix}$$

$$\frac{66}{6} = \frac{6x}{6}$$

$$\boxed{x = 11}$$