SM3 Name Key ID: 1

Unit 6 Test Review

Date _____ Period ____

Identify the domain and range of each.

1) $y = \log_2(4x + 22) + 2$

2^x

$4x + 22 = 0$

$-22 \quad -22$

$\frac{4x}{4} = \frac{-22}{4}$

$x = -\frac{11}{2}$

D: $(-\frac{11}{2}, \infty)$

R: $(-\infty, \infty)$

2) $y = \log_5(3x - 5) + 4$

$3x - 5 = 0$

$+5 \quad +5$

$\frac{3x}{3} = \frac{5}{3}$

$x = \frac{5}{3}$

D: $(\frac{5}{3}, \infty)$

R: $(-\infty, \infty)$

Solve each equation.

3) $243^{3p} = 81$

$(3^5)^{3p} = 3^4$

$15p = 4$

$\frac{15p}{15} = \frac{4}{15}$

$p = 4/15$

4) $216^{-3n} = 36^n$

$6^{3(-3n)} = 6^{2n}$

$-9n = 2n$

$n = 0$

5) $\left(\frac{1}{243}\right)^{-p-2} = 27$

$(3^{-5})^{-p-2} = 3^3$

$-5(-p-2) = 3$

$5p + 10 = 3$

$-10 \quad -10$

$\frac{5p}{5} = \frac{-7}{5}$

$p = -\frac{7}{5}$

6) $625^{3b} = \frac{1}{125}$

$(5^4)^{3b} = 5^{-3}$

$\frac{12b}{12} = \frac{-3}{12}$

$b = -\frac{1}{4}$

7) $\left(\frac{1}{9}\right)^{2-3v} = 81$

$3^{-2(2-3v)} = 3^4$

$-4 + 6v = 4$

$\frac{6v}{6} = \frac{8}{6}$

$v = \frac{4}{3}$

8) $9^{3b} \cdot \left(\frac{1}{27}\right)^{3b+1} = 9^b$

$(3^2)^{3b} \cdot 3^{-3(3b+1)} = 3^{2b}$

$6b + -9b - 3 = 2b$

$-3b - 3 = 2b$

$\frac{-3}{5} = \frac{5b}{5}$

$b = -\frac{3}{5}$

9) $8^{3n} \cdot \left(\frac{1}{2}\right)^{2n+2} = \frac{1}{64}$

$2^{3(3n)} \cdot 2^{-1(2n+2)} = 2^{-6}$

$9n + -2n - 2 = -6$

$\frac{7n}{7} = \frac{-4}{7}$ $n = \frac{-4}{7}$

10) $8^{2n+2} \cdot \left(\frac{1}{64}\right)^{2-n} = 16$

$2^{3(2n+2)} \cdot 2^{-6(2-n)} = 2^4$

$6n + 6 - 12 + 6n = 4$

$12n - 6 = 4$

$\frac{12n}{12} = \frac{10}{12}$ $n = \frac{5}{6}$

Solve each equation. Round your answers to the nearest ten-thousandth.

11) $\frac{5 \cdot 10^{r+8}}{5} = \frac{30}{5}$

$\log(10^{r+8} = 6)\log$

$r + 8 = \log 6$

$-8 \quad -8$

$r = \log 6 - 8 = -7.2218$

12) $\frac{-8 \cdot 12^{5p}}{-8} = \frac{-65}{-8}$

$\ln(12^{5p} = \frac{65}{8})$

$\frac{5p \ln 12}{5 \ln 12} = \frac{\ln(65/8)}{5 \ln 12}$

$p = .1686$

13) $\frac{4e^{2b-8}}{4} = \frac{94.7}{4}$

$\ln(e^{2b-8} = \frac{94.7}{4})$

$2b - 8 = \ln(\frac{94.7}{4}) + 8$

$+8$

$\frac{2b}{2} = \frac{\ln(\frac{94.7}{4}) + 8}{2}$ 5.5822

14) $15^{9a-7} + 8 = 38$

$-8 \quad -8$

$\ln(15^{9a-7} = 30)$

$\frac{(9a-7)\ln 15}{\ln 15} = \frac{\ln 30}{\ln 15}$

$9a - 7 =$

$a = .9173$

15) $6 \cdot 9^{2x-1} + 10 = 18$

$-10 \quad -10$

$\frac{6 \cdot 9^{2x-1}}{6} = \frac{8}{6}$

$\frac{(2x-1)\ln 9}{\ln 9} = \frac{\ln(\frac{4}{3})}{\ln 9}$

$X = .5655$

16) $8 \cdot 19^{-8x-4.6} + 1 = 81$

$-1 \quad -1$

$\frac{8 \cdot 19^{-8x-4.6}}{8} = \frac{80}{8}$

$\ln(19^{-8x-4.6} = 10)$

$\frac{\ln 19 (-8x - 4.6)}{\ln 19} = \frac{\ln 10}{\ln 19}$

$-8x - 4.6 = .78201148$

$X = -.6728$

Solve each equation.

17) $\log_3(2x + 9) = \log_3 1$

$2x + 9 = 1$

$2x = -8$

$x = -4$

18) $\log_3 -2x = \log_3(-5x - 6)$

$-2x = -5x - 6$

$3x = -6$

$x = -2$

19) $\log_{20}(2p-4)=\log_{20}30$

$2p-4=30$

$2p=34$

$p=17$

20) $\log_{16}(-3x+2)=\log_{16}(7-x)$

$-3x+2=7-x$

$\frac{-5}{2}=\frac{2x}{2}$

$-\frac{5}{2}=x$

21) $\log_{12}(-3b+2)=\log_{12}(b^2+4)$

$-3b+2=b^2+4$

$b^2+3b+2=0$

$(b+2)(b+1)=0$

$b=-2$ or -1

22) $\log_{19}(18-b)=\log_{19}(b^2+2b)$

$18-b=b^2+2b$

$b^2+3b-18=0$

$(b+6)(b-3)=0$

$b=-6$ or 3

23) $-9+\log_5 7v=-7$

$+9 \qquad +9$

$\log_5 7v=2$

$5 \qquad 5$

$7v=5^2$

$7v=25$

$v=25/7$

24) $-8\log_9 -n=-16$

$\frac{-8\log_9 -n}{-8}=\frac{-16}{-8}$

$9^{\log_9 -n}=9^2$

$-n=81$

$n=-81$

25) $\log_8 10-\log_8(x+5)=2$

$8^{\log_8 \frac{10}{x+5}}=8^2$

$\frac{10}{x+5}=64$

$10=64(x+5)$

$10=64x+320$

$-310=64x$

$x=-\frac{155}{32}$

26) $\log_7 x-\log_7(x-4)=\log_7 10$

$\log_7 \frac{x}{x-4}=\log_7 10$

$\frac{x}{x-4}=10$

$x=10x-40$

$\frac{40}{9}=\frac{9x}{9} \qquad x=\frac{40}{9}$

27) $\log_6 9+\log_6(x^2-9)=4$

$6^{\log_6 9(x^2-9)}=6^4$

$\frac{9(x^2-9)}{9}=\frac{1296}{9}$

$x^2-9=144$

$+9 \quad +9$

$x^2=153$

$x=\pm 3\sqrt{17}$

28) $\log_2 4x-\log_2 5=4$

$2^{\log_2 \frac{4x}{5}}=2^4$

$5\left(\frac{4x}{5}=16\right)5$

$4x=80$

$x=20$

Rewrite the following using the Change of Base formula.

29) $\log_5 68$ $\frac{\log 68}{\log 5}$ 2.622

30) $\log_2 4.7$ $\frac{\log 4.7}{\log 2}$ 2.233

Condense each expression to a single logarithm.

31) $\log_3 z + \frac{\log_3 x}{2} + \frac{\log_3 y}{2}$ $\log_3\left(z\sqrt{xy}\right)$

32) $5\log_2 a + 2\log_2 b$ $\log_2(a^5 b^2)$

33) $3\log_2 7 + \frac{\log_2 12}{2} + \frac{\log_2 11}{2}$ $\log_2 7^3\sqrt{12\cdot 11}$ $\log_2 7^3\sqrt{132}$

34) $6\log_4 u + 18\log_4 v + 6\log_4 w$ $\log_4(u^6 v^{18} w^6)$ $\log_4(uv^3w)^6$

Expand each logarithm.

35) $\log_4\left(w^5\sqrt[3]{u}\right)$ $5\log_4 w + \frac{1}{3}\log_4 u$

36) $\log_3(u\cdot v\cdot w^5)$ $\log_3 u + \log_3 v + 5\log_3 w$

37) $\log_9\left(11\cdot 3\sqrt{10\cdot 3}\right)$ $\log_9 11! + \log_9 3 + \frac{1}{2}\log_9 3 + \frac{1}{2}\log_9 10$ $\log_9 11 + \frac{3}{2}\log_9 3 + \frac{1}{2}\log_9 10$

38) $\ln(7\cdot 2^4\cdot 11)^4$ $4(\ln 7 + 4\ln 2 + \ln 11)$ $4\ln 7 + 16\ln 2 + 4\ln 11$

Evaluate each expression without a calculator.

39) $\log_5 125$

3

40) $\log_3 81$

4

41) $\log_2 32$

5

42) $\log_2 -64$

Undefined

Find the inverse of each function.

43) $y = \log_6 x - 5$

$X = \log_6 y - 5$

$X + 5 \log_6 y$

$6^{X+5} = f^{-1}(x)$

44) $y = -10\log_4 x$

$\frac{X}{-10} = \frac{-10 \log_4 y}{-10}$

$\frac{X}{-10} = \log_4 y$

$4^{\frac{X}{-10}} = 4^{\log_4 y}$

$4^{\frac{-x}{10}} = f^{-1}(x)$

45) $y = \log_3 (3x)$

$X = \log_3 (3y)$

$3^X = 3^{\log_3 (3y)}$

$\frac{3^x}{3} = \frac{3y}{3}$

$3^{x-1} = f^{-1}(x)$

46) $y = \log_4 x - 2$

$X = \log_4 y - 2$

$X + 2 = \log_4 y$

$4^{X+2} = 4^{\log_4 y}$

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

47) $y = \log_4 5^x$

$4^X = 4^{\log_4 5^y}$

$\log_5 (4^x = 5^y)$

$\log_5 4^x = y$

48) $y = 5^x - 9$

$X = 5^y - 9$

$X + 9 = 5^y$

$\log_5 (x+9) = y$

49) $y = -\frac{6^x}{4}$

$X = -\frac{6^y}{4}$

$-4x = 6^y$

$\log_6(-4x) = y$

50) $y = -\frac{5^x}{3}$

$X = -\frac{5^y}{3}$

$-3x = 5^y$

$\log_5(-3x) = y$

Rewrite each equation in exponential form.

51) $\log_5 125 = 3$

$5^3 = 125$

52) $\log_{12} 144 = 2$

$12^2 = 144$

53) $\log 1000 = 3$

$10^3 = 1000$

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

$16^{1/4} = 2$

Rewrite each equation in logarithmic form.

55) $3^4 = 81$

$\log_3 81 = 4$

56) $8^2 = 64$

$\log_8 64 = 2$

57) $13^2 = 169$

$\log_{13} 169 = 2$

58) $20^2 = 400$

$\log_{20} 400 = 2$

Identify the domain and range of each.

59) $y = \sqrt{x-3} + 5$

D: $[3, \infty)$

R: $[5, \infty)$

60) $y = -1 + \sqrt{x+5}$

D: $[-5, \infty)$

R: $[-1, \infty)$

Solve each equation. Remember to check for extraneous solutions.

61) $\sqrt{-70+17n} = n$

$-70+17n = n^2$

$n^2 - 17n + 70 = 0$

$(n-10)(n-7) = 0$

10 or 7

$-70+17n \geq 0$

$17n \geq 70$

$\frac{17n}{17} \geq \frac{70}{17}$

$n \geq \frac{70}{17}$

62) $-2 = -8 + \sqrt{m+6}$

$+8 \quad +8$

$(\sqrt{m+6} = 6)^2$

$m+6 = 36$

$m = 30$

$m \geq -6$

63) $k = \sqrt{6k+15} - 4$

$(k+4 = \sqrt{6k+15})^2$

$k^2 + 8k + 16 = 6k + 15$

$k^2 + 2k + 1 = 0$

$(k+1)(k+1)$ $k = -1$

$6k + 15 \geq 0$

$\frac{6k}{6} \geq \frac{-15}{6}$

$k \geq -\frac{5}{2}$

64) $\frac{-45}{-9} = \frac{-9\sqrt{x-3}}{-9}$

$(5 = \sqrt{x-3})^2$

$x = 28$

$x \geq 3$

65) $\frac{1}{x^2} + \frac{5}{2x} = \frac{1}{2x^2}$ LCD $2x^2$, $x \neq 0$

$2 + 5x = 1$

$\frac{5x}{5} = \frac{-1}{5}$

$x = -\frac{1}{5}$

66) $3 + \frac{4}{b+3} = \frac{5}{b+3}$

$3(b+3) + 4 = 5$

$3b + 9 + 4 = 5$

$\frac{3b}{3} = \frac{-8}{3}$

$b = -\frac{8}{3}$

$b+3$

$b \neq -3$

Solve each equation.

67) $|p-2| = 11$

$p - 2 = 11$

$p = 13$

$-(p-2) = 11$

$-p + 2 = 11$

$-p = 9$

$p = -9$

68) $|a-3| = 5$

$a - 3 = 5$

$a = 8$

$-(a-3) = 5$

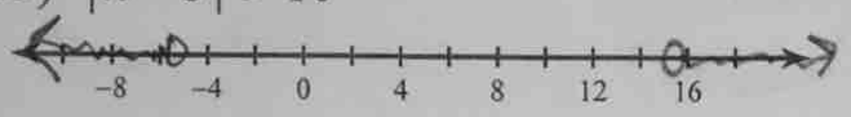
$-a + 3 = 5$

$-a = 2$

$a = -2$

Solve each inequality and graph its solution.

69) $|n-5|>10$

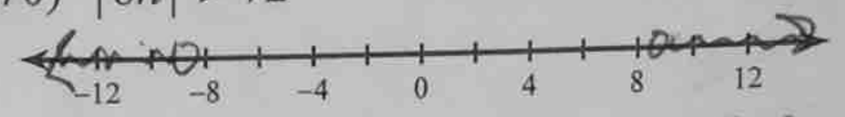


$n-5>10$ $\quad -n+5>10$

$n>15$ $\quad -n>5$

$n<-5$

70) $|8n|>72$



$\frac{8n}{8}>\frac{72}{8}$ $\quad -8n>72$

$n>9$ $\quad n<-9$

Find the inverse of each function.

71) $h(x)=\dfrac{6+3x}{2}$

$x=\frac{6+3y}{2}$

$2x=6+3y$

$\frac{2x-6}{3}=f^{-1}(x)$

72) $g(x)=\dfrac{1}{x+1}-2$

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

$(y+1)(x+2)=\frac{1}{y+1}(y+1)$

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

$f^{-1}(x)=\frac{1}{x+2}-1$

Factor each and find all roots. One root has been given.

73) $x^4+2x^3+16x^2-2x-17=0;\ -1+4i$

roots $-1+4i,\ -1-4i,\ +1,-1$

$-1+4i$	1	2	16	−2	−17
	↓	$-1+4i$	-17	$1-4i$	17
$-1-4i$	1	$1+4i$	-1	$-1-4i$	☺
	↓	$-1-4i$	0	$1+4i$	
	1	0	−1	0	

$x^2-1=(x+1)(x-1)$

	x	$+1$
		$-4i$
x	x^2	x	$-4ix$
-1	x	1	$-4i$
$4i$	$4ix$	$4i$	$+16$

$x^2+2x+17$

$(x-1)(x+1)(x^2+2x+17)$

74) $x^5-4x^4-15x^3+44x^2-54x+168=0;\ 4+\sqrt{2}$

$4+\sqrt{2}$	1	−4	−15	44	−54	168
	↓	$4+\sqrt{2}$	$2+4\sqrt{2}$	$-44+13\sqrt{2}$	$6+12\sqrt{2}$	-168
$4-\sqrt{2}$	1	$\sqrt{2}$	$-13+4\sqrt{2}$	$3\sqrt{2}$	$-48+12\sqrt{2}$	☺
	↓	$4-\sqrt{2}$	16	$-4\sqrt{2}$	$12-3\sqrt{2}$	48	$-12\sqrt{2}$
	1	4	3	12	☺	

$(x^3+4x^2)+(3x+12)$

$x^2(x+4)+3(x+4)$

$(x^2+3)(x+4)$

	4	$\sqrt{2}$
-13	-52	$-13\sqrt{2}$
$4\sqrt{2}$	$16\sqrt{2}$	8

$x=4\pm\sqrt{2},\ \pm i\sqrt{3},\ -4$

Fix

SM3 Unit 6 Test Review Part 2

1. Circle all that are true. If $b < 1$, then $f(x) = b^x$ is:

b>1

Increasing decreasing always positive always negative

2. Which point is common to every exponential function of the form $f(x) = b^x$? Explain for credit.

(0, 1)

anything to the zero power is 1

3. Which point is common to every logarithmic function of the form $f(x) = \log_b x$? Explain for credit.

$b^y = x$ (1, 0)

inverse function

4. You have saved up some money. You decide to invest your money in a fund that compounds continuously at 5%. How many years does it take for you to triple the present amount?

$\ln(3 = e^{.05t})$

$\frac{\ln 3}{.05} = \frac{.05t}{.05}$ $t = 21.97$ yrs.

5. Solve the inequality and write your answer in interval notation.

$(2x - 1 \le \sqrt{4x+1})^2$

$4x^2 - 4x + 1 = 4x + 1$

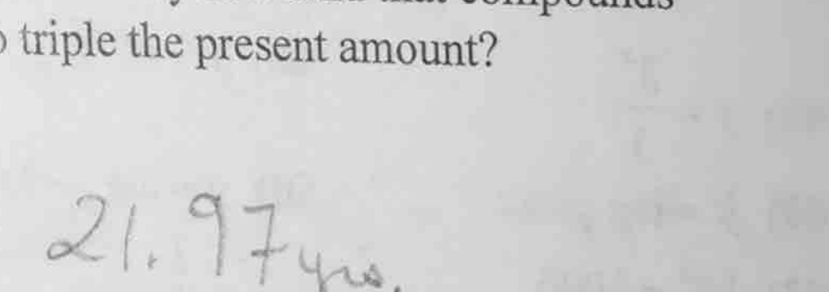
$4x^2 - 8x = 0$

$4x(x-2) = 0$

$x = 0$ or $x = 2$

$4x + 1 \ge 0$

$x \ge -\frac{1}{4}$



$[-\frac{1}{4}, 2]$

$2 - 1 \le \sqrt{4+1}$

$2 - 1 \le \sqrt{5}$

$3 \le 3$

$6 - 1 \le \sqrt{13}$

6. For the following function state the following. $\frac{3x^3+4x^2-4x}{x^2-4}$

$$\begin{array}{r} 3x+4 \\ x^2-4 \overline{)\,3x^3+4x^2-4x} \\ \underline{3x^3 \quad\quad -12x} \\ 4x^2-8x \end{array}$$

$$\frac{x(3x^2+4x-4)}{(x-2)(x+2)}$$

a. the y-intercept $(0,0)$

b. the x-intercept $\left(\frac{2}{3},0\right)$

c. any vertical asymptotes $x=2$

d. any horizontal or oblique asymptotes oblique $3x+4$

e. any holes @ -2

$$\frac{x(x+2)(3x-2)}{(x-2)(x+2)}$$

$(x+\frac{6}{3})(x-\frac{2}{3})$

$(x+2)(3x-2)$

-12, 6, -2, $+4$

7. Pickles and Peeps are starting a company selling poppers. They have derived a price equation, $p(x) = -x^2 + 50x$. The cost to produce x poppers is given by $C(x) = 3x + 25$. Write a function that represents their profit.

$p(x) \cdot x =$

$-x^3+5x^2-(3x+25)$

$R(x) = -x^3+5x^2-3x-25$

8. The Smith's bought a boat for \$9,500 three years ago. If the boat depreciates at a rate of 4.5% per year, how much is the boat worth now?

$A = 9500(1-.045)^3$

$A = \$8{,}274.35$

FYI: You will have a linear programming story problem on this test. This is similar to the linear programing problem you had on Unit Test 5.