KEY--1010 REAL Review for Final Exam

1) T(12) is the tuition paid for 12 credit hours.

2) Because the graph is a function we know that a point (2, something other than 3) is not on the graph because including such a point would make it not a function. (The input of 2 would be associated with two different output values and graphically it wouldn't pass the vertical line test.)

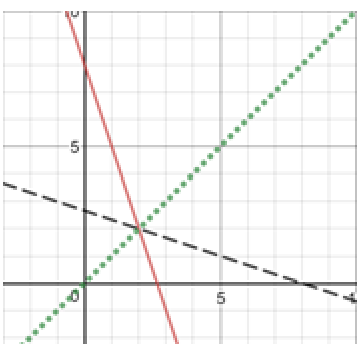
3) Substituting 3 for x and -5 for y in the two inequalities makes both of the inequalities false. $-32 \not> -1, 31 \not< 4$To be a solution to the system, these values would need to make BOTH of the inequalities true.

4) a)The output of a function is always represented by the dependent variable.
b)The dependent variable is always labeled on the vertical axis.5) The slope of this function is -4. This means that the amount of water in the leaky bucket is reduced (slope is negative) by 4 ounces every minute. The y-intercept is 126; this means that the initial or beginning amount of water in the bucket was 126 ounces.

6) Slope of a linear function is the CONSTANT rate of change. The average rate of change can be found for any function (It's the change in the outputs of the function divided by the change in the inputs of the function); but since the average rate of change is constant for a linear function, the slope and the average rate of change are the same.

7) The average rate of change is $\frac{10-24}{2008-2006}$=$\frac{-14}{2}$= -7 ; To determine if it's a linear function, see if the average rate of change is constant- find the average rate of change between (any) two different years. For example $\frac{36-10}{2010-2008}$=8. The average rate of change is not the same (constant) so this is not a linear function.

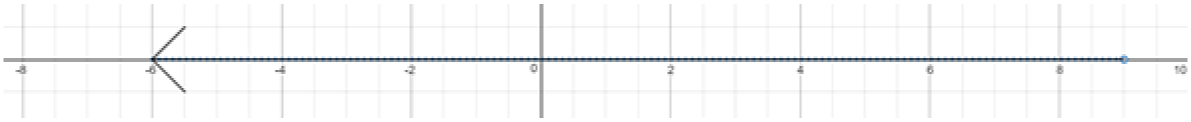
8)
b. $f^{-1}(x) = \frac{-x}{3}+\frac{8}{3}$



d. Find two points on the line of f(x)=3x+8 , then switch the x and y coordinates and plot them.

9) (5,-3,-4)

10) $(-\infty, 9)$



11) No. Following order of operations means you must evaluate exponents before multiplying bases

12) $x^3 - 12x^2 + 48x - 64$

13) $x^2 - 2x + 4\ Remainder\ -7$

14) No. The output of a square root can never be negative because if “a” (the radicand) is negative the result would be an imaginary number, not negative, and if the radicand is positive, the result will be positive.

15) No. The output of $\sqrt{x+2}$ must be positive.

16) $(\sqrt{x}+5)^2 = x + 10\sqrt{x} + 25 \neq x + 25$

17) a) No solution; After solving, x=38 but always check: $(38-2)^{1/2} = +6$, not -6 so 38 is a NOT a solution.

b) x=9/7check: $4\sqrt{9/7} = 4 * 3\sqrt{7}/7 = 12\sqrt{7}/7$and $\sqrt{9(9/7)+9} = 3\sqrt{9/7+1} = 3\sqrt{16/7} = 3 * 4\sqrt{7}/7 = 12\sqrt{7}/7$

c) x=-3 check: $\sqrt{2(-3)+15} = \sqrt{-6+15} = \sqrt{9} = 3$and $3-(-3) = 6$

18) Take the cube rube of (-125) which is -5, since (-5)(-5)(-5) = -125 then take (-5) to the 4th power. This is 625 since (-5)(-5)(-5)(-5) = 625

19) a) Fourth root of 16 is 2. 2 to the 5th power is 32.

b) The cube root of -8 is -2 and the square of -2 is 4.

c) The square root of 49/81 is 7/9 the negative exponent moves (inverts) them so that we end up with 9/7.

d) The cube root of -8/27 is -⅔ taking this to the fourth power we get 16/81, then apply the negative exponent and get 81/16. (Sometimes it’s easier to get rid of the negative exponent first thing by inverting the fraction or number. Then continue working the problem with a positive exponent.)

20) a) xy^2 b) $3k/m^2$

21) a) $-7k^3q^4\sqrt{5k}$ b) $4\sqrt[3]{6}$ c) -3

22) a) $\frac{\sqrt{2}}{x^2}$ b) $\frac{x\sqrt[3]{4x^2}}{2}$ c) $-2\sqrt{3} - \sqrt{15}$

23) To combine radicals by adding or subtracting, they must be “like things”, meaning they would need to have the same index numbers and the same radicands.

24) No, we cannot simplify it since they are not like terms and we cannot make them into like terms. We would need to be able to make the numbers inside the radicals (the radicands) the same by simplifying each radical.

25) a) $-15\sqrt{3}+4\sqrt{3}=-11\sqrt{3}$ b) $-6\sqrt{5}-6\sqrt{5}-2\sqrt{6}=-12\sqrt{6}-2\sqrt{6}$

26) False. Since we would need a third cube root of x in order for this to = x $\sqrt[3]{x}*\sqrt[3]{x}=\sqrt[3]{x^2}$

27) a) $g(f(x)) = 12x^2+9x+13$ b) $g(f(-4)) = -438$

28) a) $g\big(f(t)\big)=0.25\pi t^2$

b) The input is the number of seconds after the pebble hits the water. The output is the area enclosed by the outer ripple in square feet.

29) a) Vertical intercept: (0, 37.6) 37.6% of adults were smokers in 1970

b) Decay factor = .984

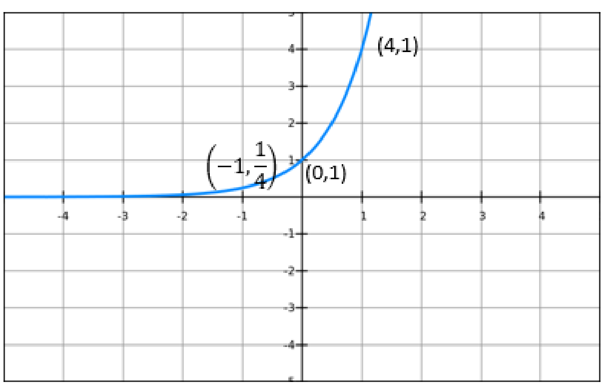
c) $p(50) \approx 17\%$

30) Plan 1: $S=1000x+25000$, Plan 2: $S=25000(1.03)^x$

31) Data Set #1: a) linear b) slope = ½ c) increasing d) $y=\frac{1}{2}x+4$

Data Set #2: a) exponential b) decay factor = ⅗ c) decreasing d) $y=3(\frac{3}{5})^x$or $y=3(.6)^x$

32) a) $C(t)=27000(1.05)^t$ b) $C(4)=32818.67$



33)

a) Domain: $(-\infty,\infty)$

b) Range: $(0,\infty)$

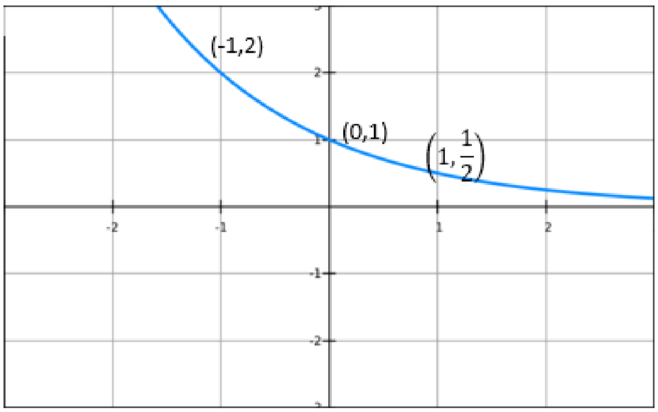
c) The graph increases for all values of x

d) None

e) (0,1)

f) Horizontal asymptote, y = 0

34) Since $0<1/2<1$, the function is decreasing. $f(0)=8$



35)

a) Domain: $(-\infty, \infty)$
b) Range: $(0, \infty)$

c) No values, the graph decreases for all values of x

d) None

e) (0,1)

f) Horizontal asymptote, y = 0

36) Because the base is positive, all outputs will be positive (and therefore not the 0 required for an x-intercept).

37) $y = 2(2.77)^x$ 15.35, 42.51, 117.75

38) a) $\log_6 216 = 3$ b) $\log_3 1/9 = -2$ c) $\log_{10} 0.01 = -2$

39) The output of a logarithmic function is the exponent that when applied to the base gives the input value. Also, in a log equation, the logarithm side of the equation is equal to the exponent.

40) Yes, a logarithmic *function* can represent the inverse of an exponential *function* because $y = \log_b x$ is the inverse of $y = b^x$; However, just changing an equation from its exponential form to its equivalent logarithmic form does not make it an inverse. To be an inverse, the outputs and the inputs of a function are swapped so the x and y variables trade places.

41) a) $2^{-3} = \frac{1}{8}$ b) $10^{-5} = 0.00001$ c) $3^2 = 9$

42) a) x = 3; b) a = 3; c) n = 0; d) x = 9; e) x = 5; f) x = 1; g) x = 7; h) x = 1

43) a) $(0, \infty)$ b) $(-\infty, \infty)$ c) $(0, \infty)$ d) (1, 0) e) n/a f) vertical; y-axis (equation: x=0)

44) a) $(0, \infty)$ b) $(-\infty, \infty)$ d) None d) (1, 0) e) n/a f) vertical; y-axis (equation: x=0)

45) a) $y=\log_8 x$ b) $y=9^x$ Finding the inverse involves switching the x- and y- variables and solving for y; changing an exponential or logarithm to its equivalent form doesn not involve switching those variables.

46)The Zero Product Rule says that if the product is zero, then either one or all of the factors must be zero.

47) a) x=3/2, $-\frac{1}{3}$ b) x= 2/3 , -1 c) x=0, 4 d) x=1/3 , -4

48) x= 17,1

49) a) 6.05 Seconds b) 149 ft c) t= 1,5 d) (0,149)

50) $-6 \pm 3\sqrt{2}$

51) $\frac{-6\pm\sqrt{11}}{5}$

52) Factor, Quadratic Formula, Graphically, Complete the square

53) D

54) The answer is obtained by realizing that the points on both sides of a parabola are symmetric to the axis of symmetry. The point (-4,5) can be plotted by starting at the vertex point (-1,1) and going to the left 3 places and up 4 places; to plot another point on the parabola that is symmetric to (-4,5) on the right side of the vertex, start at the vertex and move 3 points to the right and up 4 places; this point is at (2,5). (It helps to graph the first two points before finding the 3rd point.)

55) X=3; The two points (-5,0) and (11,0) are symmetric on either side of the axis of symmetry so to find the axis of symmetry, find the x coordinate that is exactly between the x coordinates of -5 and 11; you can do this graphically or find the midpoint by adding -5 + 11 and dividing by 2 = 3. (The axis of symmetry should always be represented as the equation of a line so "x=3" is needed, not just 3.)

56) Vertex (1,3), Axis of symmetry X=1, Parabola opens up; note there is no x-intercept, y intercept = (0,5). Two additional points: Answer may vary.

57) X-intercepts (7,0) and (-1,0). Y-intercept (0,-7)

58a) The vertical intercept =4973. Practical meaning: The number of higher-order multiple births in 1995 was 4973.
58b) In 1998 and in 2005

59) $\frac{1}{3} \pm \frac{2\sqrt{5}}{3}i$

60) Every point on the graph moves one unit down

61) 9 + 3i b) 2 + 12i c) 13 - 2i

62) $(7-5i)(2-5i) = 14-35i-10i+25i^2 = 14-45i+25(-1) = -11-45i$

63) No, you cannot factor out an $(x+7)$ in the numerator. Only common *factors* in the numerator and denominator can make a "multiplicative inverse" pair (or form of one) that can be reduced out of the fraction. You can reduce out this "form of one" because the multiplicative identity property says that multiplying by one does not change the value of a number.

64) Using the formula for the area of a rectangle, A=lw; $(5x^9y^6/4p^9q)/(4x^8y^4/p^8) = 5xy^2/16pq$;

65) $(x-5)$ or $(5-x)$

66) $\frac{-3}{6-k}$; You can obtain this by multiplying the numerator AND denominator by -1. (-1/-1 is a form of one so multiplying by this does not change the value of fraction.)

67a) $\frac{18}{55}$ b) $\frac{-140}{51}$ $or\ -2\frac{38}{51}$ c) $\frac{16}{x}$ d) $\frac{2-3x}{3x}$

68) When adding rational expressions, we use the least common denominator to write an expression equivalent to the sum of the given expressions. We do not clear fractions when adding rational expressions. When solving rational equations, we use the least common denominator to clear fractions and then proceed to find the value(s) of the variable for which the equation is true.

69) Yes, both of these equal $28x^2 - 45 + 18$; 7x-6 is equivalent to (-1)(6-7x) and 4x-3 is equivalent to (-1)(3x-4) so even though the factors are not equivalent, the products are.

70a) x=1.788 b) x=5 c) x=-2.375

71 a) -$\frac{1}{4r}$ b) $\frac{y+2}{5}$ c) $\frac{2t+3}{t+1}$ d) $\frac{z-2}{z}$

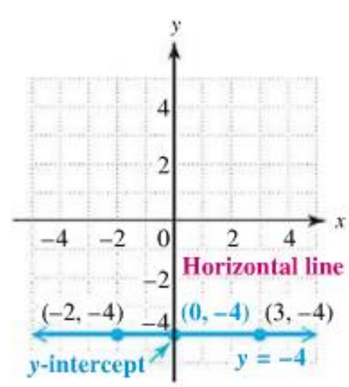
72) a) $\frac{x^2-3x+16}{(x-4)(x+4)(x+1)}$ b) $\frac{5m^2-3m-72}{m(m-10)}$ c) $\frac{-11}{y-5}$ or $\frac{11}{5-y}$

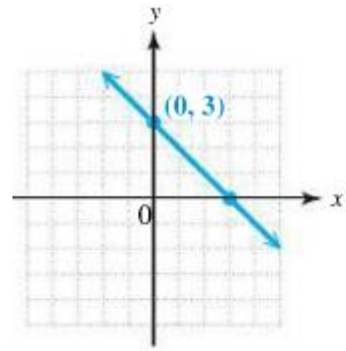
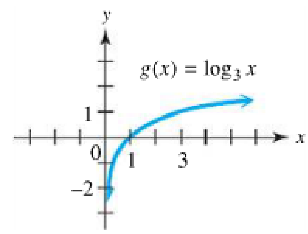
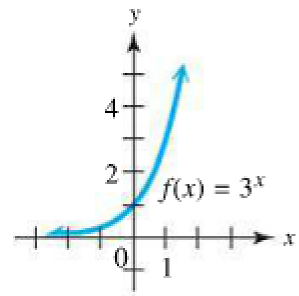
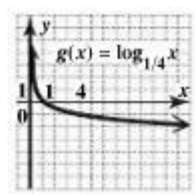
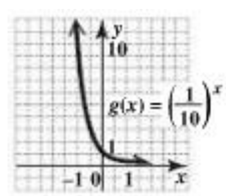
73) C≈1.188 milligrams

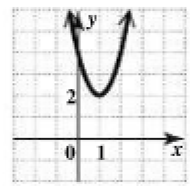
74) R≈5.652 ohms

75) $T = \frac{t_1 t_2}{t_x + t_2}$

76) Note - 2 points are not labeled in all of the sketches of the graphs, but should be easily identifiable from coordinate planes. Make sure you have labeled two points in your graph, though.

Constant Function	$y = -4$	

Linearly Decreasing Function	$y = -x + 3$	
Logarithmically Increasing Function	$g(x) = log_3 x$	
Exponentially Increasing Function	$f(x) = 3^x$	
Logarithmically Decreasing Function	$g(x) = log_{\frac{1}{4}} x$	
Exponentially Decreasing Function	$g(x) = \left(\frac{1}{10}\right)^x$	
Quadratic Function with Complex Zeros	$f(x) = 2(x-1)^2 + 2$	No need to label points, just sketch.

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