Pre-Calculus Homework #6

1) Find $(f-g)(x)$, $(g \cdot f)(x)$, and $(g \circ f)(x)$ if $f(x) = -4x+7$ and $g(x) = 6x^2 + 5x - 1$ and then evaluate $(g / f)(-8m)$

2) Graph the equation $y = x$ and then use this graph to determine whether it is symmetric to the x axis, y axis, and/or the origin AND determine if it is even, odd, or neither even nor odd. Write an equation for a function that has a graph with the shape of $y = x$ but is shifted 4 units down, shifted 9 units to the right, is upside down, and "skinnier" by a factor of 3.

3) Angela wants to create an open, rectangular box out of a piece of paper that is 8 inches wide by cutting square pieces out of each corner of the paper and folding up the sides so that the length of the bottom of the box is 16 inches long. Use completing the square to determine how large she should make each square (the length of the side of each square) in order to maximize the volume inside the box AND determine what the volume of that box would be.

4) Construct and simplify $\dfrac{f(x-a)+f(x)}{a}$ if $f(x) = -5x^2 + 7x - 9$

5) Solve the inequality $\dfrac{1}{x^3 + 2x^2 - 8x} \geq \dfrac{4}{x^3 - 7x^2 + 10x}$ and graph your final answer on a number line.

6) Silas leaves the church at 8am and rides his bike due north at a rate of 6 mph. Emily leaves the church at noon and rides her bike due east at a rate of 16 mph. What time of day will it be when they are exactly 80 miles away from each other?

7) Use Descartes' rule of signs to determine the nature of the roots for the function $f(x) = -3x^5 + 8x^4 - 2x^3 - 9x^2 + 1x + 7$ and then use this information, along with your knowledge of end behavior, to make an approximate graph for each possible scenario.

8) Find the equations for all of the vertical, horizontal, and oblique asymptotes for the function $f(x) = \dfrac{4x^3 - 7x^2 + 8x - 3}{x^2 - 13x - 30}$

9) List all of the possible rational zeros, find all of the rational, irrational, or imaginary zeros if $f(x) = 0$, then factor $f(x)$ and then use this information, along with your knowledge of end behavior, to make an approximate graph for the function if $f(x) = 2x^5 + 3x^4 - 25x^3 - 15x^2 + 23x + 12$

10) Emma leaves the church at 7am and jogs due south at a rate of 5 mph. Jacob leaves the church at 10am and rides his moped due west at a rate of 24 mph. What time of day will it be when they are exactly 78 miles away from each other?

11) Use Descartes' rule of signs to determine the nature of the roots for the function $f(x) = 9x^4 - 7x^3 + 4x^2 - x + 5$ and then use this information, along with your knowledge of end behavior, to make an approximate graph for each possible scenario.

12) Find the equations for all of the vertical, horizontal, and oblique asymptotes for the function $f(x) = \dfrac{8x^2 - 9x + 7}{6x^2 + 13x - 15}$

13) List all of the possible rational zeros, find all of the rational, irrational, or imaginary zeros if $f(x) = 0$, then factor $f(x)$ and then use this information, along with your knowledge of end behavior, to make an approximate graph for the function if $f(x) = 3x^5 + x^4 - 8x^3 + 16x^2 - 80x + 48$

14) A truck drops off a hot air balloon in a field so that it can be prepared for a flight and then leaves the field at 1pm travelling in a straight line at 45 mph. If the hot air balloon takes off at 9am and travels straight up at a rate of 8 mph, what time of day will it be when the truck and balloon are exactly 102 miles away from each other?

15) Use Descartes' rule of signs to determine the nature of the roots for the function $f(x) = -4x^6 + 3x^5 - 2x^4 - 5x^3 + 9x^2 - x - 7$ and then use this information, along with your knowledge of end behavior, to make an approximate graph for each possible scenario.

16) Find the equations for all of the vertical, horizontal, and oblique asymptotes for the function $f(x) = \dfrac{64x^2 - 3x + 7}{32x^3 - 36x^2 - 81x}$

17) List all of the possible rational zeros, find all of the rational, irrational, or imaginary zeros if $f(x) = 0$, then factor $f(x)$ and then use this information, along with your knowledge of end behavior to make an approximate graph for the function if $f(x) = -x^4 - 2x^3 - x^2 - 32x + 240$

18) A boat drops off a diving vessel in the middle of the ocean. If the boat speeds away at 1 pm, in a straight line, at a speed of 8 mph and the diving vessel starts its decent, straight down, at 11 am at a rate of 3 mph, what time of day will it be when the boat and the diving vessel are exactly 20 miles apart from each other?

19) Find the equations for all of the vertical, horizontal, and oblique asymptotes for the function $f(x) = \dfrac{6x^3 - 17x^2 + 7x - 5}{3x^2 + 14x - 24}$

20) List all of the possible rational zeros, find all of the rational, irrational, or imaginary zeros if $f(x) = 0$, then factor $f(x)$ and then use this information, along with your knowledge of end behavior, to make an approximate graph for the function if $f(x) = 2x^6 - x^5 - 26x^4 + 16x^3 + 90x^2 - 39x - 90$