

Pre-Calculus Homework #5

- 1) Graph, determine if the graph is a function and, if it is, rewrite the relation using function notation, find all relative maxima and minima, determine the domain and range, and identify the intervals where the graph is increasing or decreasing for the relation $y = x^3 + 3x^2 - 9x$

2) Solve: $96x^3 - 88x^2 = 120x$

3) Solve $2x^{\frac{1}{2}} + 5x^{\frac{1}{4}} = 3$

- 4) Graph, determine if the graph is a function and, if it is, rewrite the relation using function notation, find all relative maxima and minima, determine the domain and range, and identify the intervals where the graph is increasing or decreasing for the following piecewise relation

$$y = \begin{cases} 3|x-7|-3 & \text{for } x > 3 \\ \frac{3}{2}x+1 & \text{for } 3 \geq x > -3 \\ -2x^2 - 24x - 63 & \text{for } x \leq -3 \end{cases}$$

5) Solve: $\sqrt{2x-2} + 1 = \sqrt{3x-2}$

- 6) Find $(g + f)(x)$, $(g \cdot f)(x)$, and $(g \circ f)(x)$ if $f(x) = 3x - 5$ and $g(x) = -3x^2 - 2x + 2$ and then evaluate $(g / f)(-4)$

- 7) Graph the equation $y = x^2$ 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 $y = x^2$ but is shifted 7 units up, shifted 8 units to the left, and is upside down.

- 8) Solve $4x^2 - 16x = 11$ by completing the square and then verify your solutions using the quadratic formula.

- 9) Construct and simplify $\frac{f(x+h) - f(x)}{h}$ if $f(x) = 6x^2 - 5x + 3$

- 10) Solve the inequality $\frac{3}{x^2 - 16} \leq \frac{2}{x^2 - 4x}$ and graph your final answer on a number line.

- 11) Find $(f - g)(x)$, $(f \cdot g)(x)$, and $(f \circ g)(x)$ if $f(x) = -4x + 3$ and $g(x) = 3x^2 + 6x - 7$ and then evaluate $(f / g)(-6a)$

- 12) 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 3 units down, shifted 9 units to the right, is “skinnier” by a factor of 4, and is upside down.
- 13) Solve $3x^2 + 9x = 7$ by completing the square and then verify your solutions using the quadratic formula.
- 14) Construct and simplify $\frac{f(x-k) + f(x)}{k}$ if $f(x) = 2x^3 - x^2 + 7$
- 15) Solve the inequality $\frac{2}{x^2 - 9} < \frac{3}{x^2 - 2x - 15}$ and graph your final answer on a number line.
- 16) Graph the equation $y = \frac{x^3}{64}$ 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 $y = x^3$ but is shifted 2 units up, shifted 6 units to the left, and is “fatter” by a factor of 5.
- 17) Solve the inequality $\frac{5}{x^2 - x - 12} \leq \frac{3}{x^2 - 3x - 4}$ and graph your final answer on a number line.
- 18) Nina wants to build a fence around part of her backyard so that her dog can go outside without running away. Nina has 160 feet of fence and will use the back of her house as one side of the rectangular enclosure. Use completing the square to determine the dimensions (length and width) of the enclosure in order to maximize the area AND determine how much area this new fence provides for her dog.
- 19) Solve the inequality $\frac{6}{x^2 - 7x} \leq \frac{14}{x^2 - 3x - 28}$ and graph your final answer on a number line.
- 20) Joshua launches a model rocket with an initial velocity of 280 feet per second from a platform 7 feet off the ground. Find the equation for the flight path of the rocket where x stands for the time, in seconds, after launch and y stands for the height, in feet, of the rocket. Use completing the square to determine how many seconds after launch the rocket got to its maximum height AND determine the maximum height of the rocket.