Find the domain of the given function.

1)
$$f(x) = \frac{\sqrt{x+3}}{(x+3)(x-2)}$$
 2) $f(x) = \frac{4}{x^2}$ 3) $f(x) = \sqrt{9-x}$

Find the range of the function.
4)
$$f(x) = (x - 2)^2 + 2$$
5) $f(x) = (x + 5)^2 + 8$
6) $f(x) = \frac{13}{3 - x}$

7) Use the graph of f to estimate the local maximum and local minimum. Determine where the function is increasing and decreasing.



Find the zeros of the polynomial function and state the multiplicity of each.

8)
$$f(x) = (x+2)^2(x-1)$$

9) $f(x) = 3(x+8)^2(x-8)^3$

Find the zeros of the function. (show work)

13)
$$f(x) = x^3 - 49x$$

14) $f(x) = 3x^3 - 12x^2 - 15x$
15) $f(x) = x^3 - 9x^2 + 8x + 60$

Graph the piecewise-defined function.

$$f(x) = \begin{cases} 2x - 2, \text{ if } x < 0 \\ -2x + 1, \text{ if } x \ge 0 \end{cases}$$



$$y(x) = \begin{cases} 9x + 8, \text{ if } x < 0\\ x^2 - 2, \text{ if } x \ge 0 \end{cases}$$

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$$f(x) = \begin{cases} x - 1 & \text{if } x \le -2 \\ 2x - 1 & \text{if } -2 < x \le 4 \\ -3x + 8 & \text{if } x > 4 \end{cases}$$



Given $f(x) = 2x^2 - x$, find the following and simplify. $\frac{f(x+h) - f(x)}{h}$

Given $C(x) = 2x^2 - 4x + 3$, find and simplify $\frac{C(x+h) - C(x)}{h}$

Write the equation of a quadratic function that has the following transformations: expand horizontally by a factor of 2 translate right 1 unit translate up 3 units

Write the equation of an absolute value function that has the following transformations:

compress vertically by a factor of 3 reflect across the x-axis translate right 2 units translate down 3 units

Describe the transformations present to the following parent functions

 $\underline{h}(x) = -(x-3)^2 + 1$ $g(x) = -2(x+1)^2 + 3$

Sketch the graph of the polynomial: $g(x) = x^4 - 4x^2$
State End Behavior
Max # of Turns
Factor the Polynomial to find the zeros
Graph the polynomial
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Sketch the graph of the polynomial: $f(x) = -x^4 + 9x^2 - 20$
State End Behavior
Max # of Turns
Factor the Polynomial to find the zeros
Graph the polynomial
Sketch the graph of the polynomial: $f(x) = 3x^3 + x^2 - 27x - 9$
State End Behavior
Max # of Turns
Factor the Polynomial to find the zeros
Graph the polynomial
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Concepts/Short Answer

1. Explain the difference between a rational number and an irrational number. Provide an example of each

2. Why is it that a quadratic function can have no real zeros but a cubic function must have at least one real zero? Use a sketch of each function to support your position.

3. Explain what it means for a value to be excluded from the domain of a function. Provide examples of a function that has excluded values.

4. In the quadratic formula, what is the discriminant and how does it help us determine the number of real zeros a quadratic function has?