Unit 1A Test Review

Find the domain of the given function.

1) $f(x) = \frac{\sqrt{x+3}}{(x+8)(x-2)}$

All Reals > -3
except +2

2) $f(x) = \frac{4}{x^2}$

$\mathbb{R}$ except 0

3) $f(x) = \sqrt{9-x}$

$\mathbb{R} \le 9$

Find the range of the function.

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

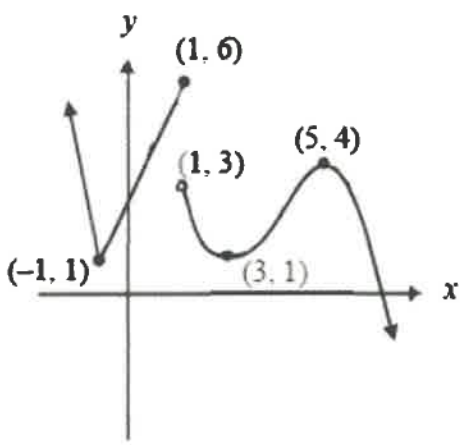
$[2, \infty)$

5) $f(x) = (x+5)^2 + 8$

$[5, \infty)$

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 decresing.



min: (-1,1), (3,1)
max: (5,4)
Decrease: $(-\infty,-1)$ (1,3) $(5,\infty)$
Increase (-1,1) (3,5)

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

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

x = -2 mult 2
x = 1

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

x = -8 mult 2
x = 8 mult 3

Find the zeros of the function. (show work)

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

$x(x^2-49)$
$x(x+7)(x-7)$
$\boxed{x = 0, 7, -7}$

14) $f(x) = 3x^3 - 12x^2 - 15x$

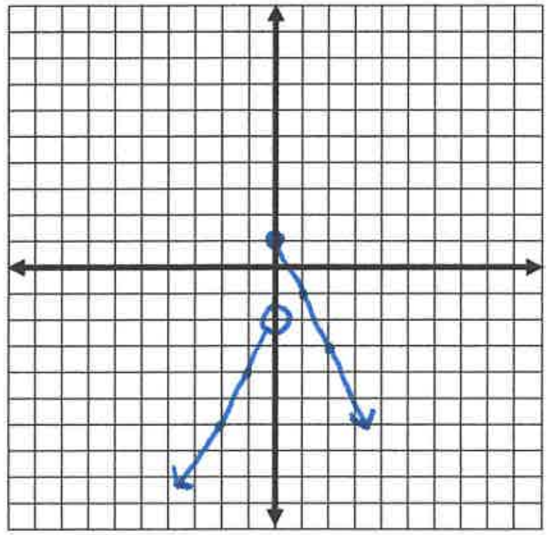
$3x(x^2-4x-5)$
$3x(x-5)(x+1)$
$\boxed{x = 0, 5, -1}$

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

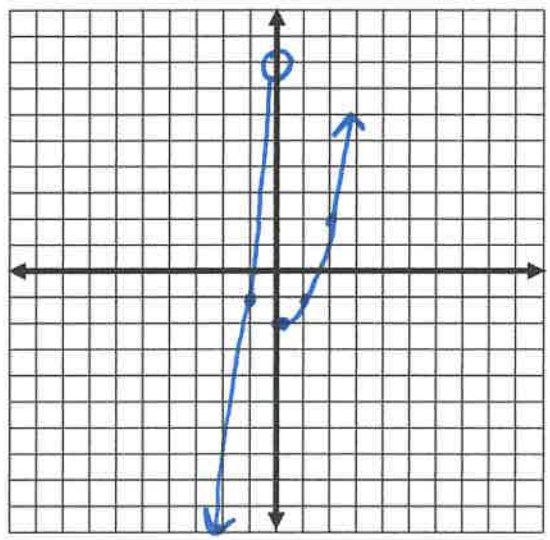
Unit 1A Test Review

Graph the piecewise-defined function.

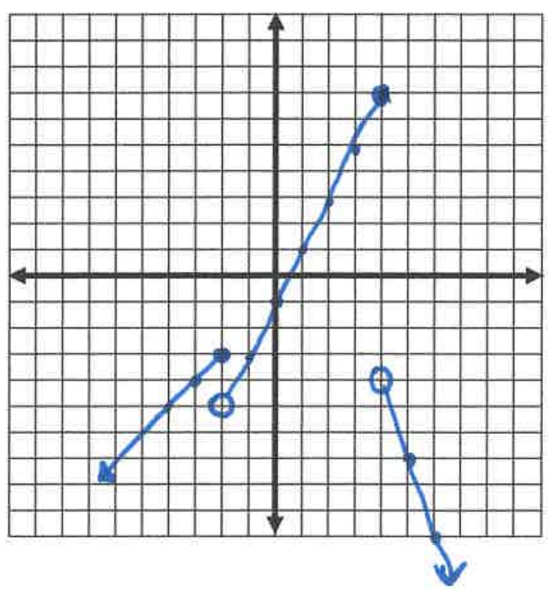
$$f(x) = \begin{cases} 2x - 2, \text{ if } x < 0 \\ -2x + 1, \text{ if } x \geq 0 \end{cases}$$



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



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



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

$2(x+h)^2 - (x+h) - (2x^2 - x)$

$2(x^2 + 2xh + h^2) - x - h - 2x^2 + x$

$\cancel{2x^2} + 4xh + 2h^2 \cancel{-x} - h \cancel{-2x^2} \cancel{+x}$

$\dfrac{2h^2 + 4xh - h}{h} = \dfrac{\cancel{h}(2h + 4x - 1)}{\cancel{h}} = \boxed{2h + 4x - 1}$

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

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

$2(x^2 + 2xh + h^2) - 4x - 4h + 3 - 2x^2 + 4x - 3$

$\cancel{2x^2} + 4xh + 2h^2 \cancel{-4x} - 4h \cancel{+3} \cancel{-2x^2} \cancel{+4x} \cancel{-3}$

$\dfrac{2h^2 + 4xh - 4h}{h} = \dfrac{\cancel{h}(2h + 4x - 4)}{\cancel{h}} = \boxed{2h + 4x - 4}$

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

$f(x) = \left(\frac{1}{2}x - 1\right)^2 + 3$

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

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

Describe the transformations present to the following parent functions

$h(x) = -(x-3)^2 + 1$

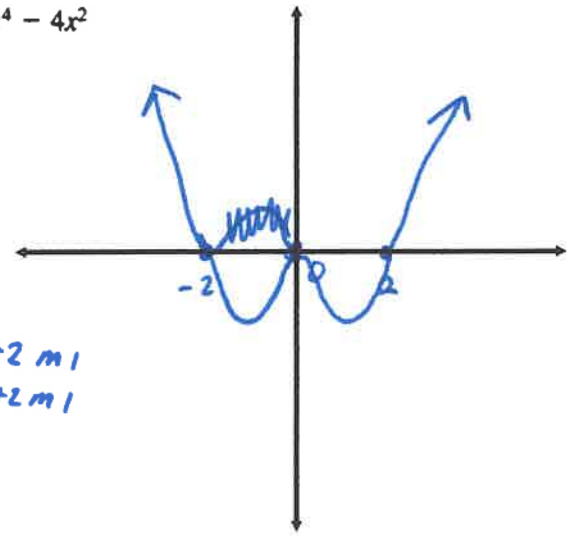
Reflect over x
right 3
up 1

$g(x) = -2(x+1)^2 + 3$

Reflect over x
left 1, up 3
V. Stretch by 2

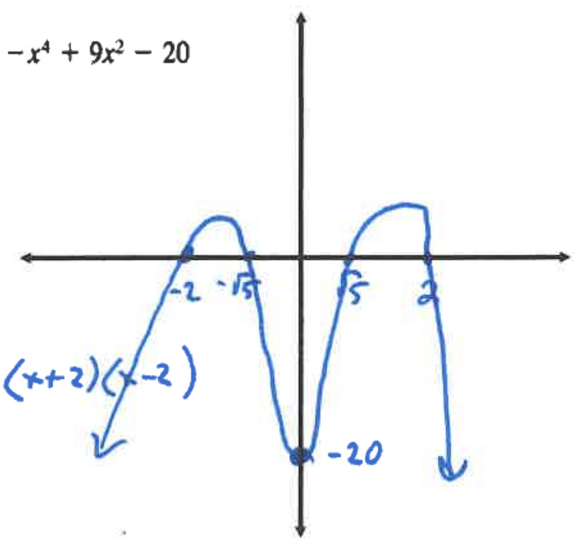
Unit 1A Test Review

Sketch the graph of the polynomial: $g(x) = x^4 - 4x^2$



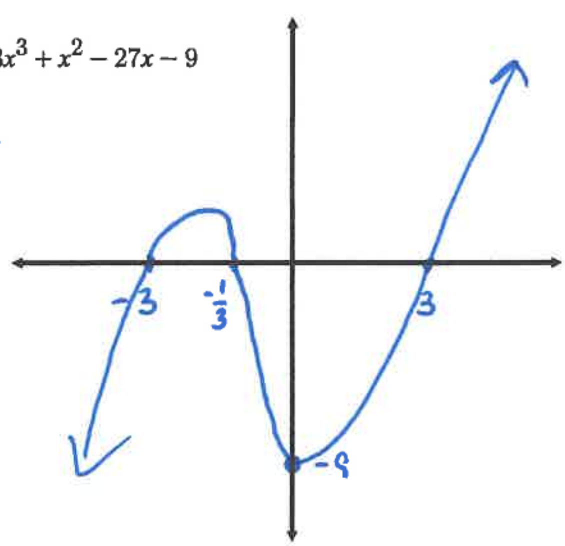
- State End Behavior rise right/left
- Max # of Turns 3
- Factor the Polynomial to find the zeros
  $x^2(x+2)(x-2)$ $x = 0$ m2, -2 m1, $+2$ m1
- Graph the polynomial

Sketch the graph of the polynomial: $f(x) = -x^4 + 9x^2 - 20$



- State End Behavior fall left+right
- Max # of Turns 3
- Factor the Polynomial to find the zeros
  $-1(x^4+9x^2+20) = -1(x^2-5)(x^2-4) = -1(x^2-5)(x+2)(x-2)$
- Graph the polynomial
  $x = \pm\sqrt{5}, -2, 2$ all m1

Sketch the graph of the polynomial: $f(x) = 3x^3 + x^2 - 27x - 9$



- State End Behavior down left up right
- Max # of Turns 2
- Factor the Polynomial to find the zeros
  $(x+3)(x-3)(3x+1) \rightarrow x = \pm 3, -\frac{1}{3}$ all m1
- Graph the polynomial

Unit 1A Test Review

Concepts/Short Answer

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

A rational number can be made into a ratio. Rational numbers are terminating or "repeating" decimals. Examples: $4, \frac{1}{3}, .5, -1\frac{1}{2}$

Irrational numbers can not be made into a ratio because they are non-repeating non terminating decimals. Examples: $\pi, e, \sqrt{2}, \sqrt{3}$

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.

because the range of quadratics are not $\mathbb{R}$, and it is possible to graph a quadratic that doesn't pass thru the x axis, such as  or 

Cubics (or any odd degree polynomial) have a range of $\mathbb{R}$ therefore their graphs must pass thru the x axis such as 

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.

Excluded Values are values of x that would result in a y value that is undefined. Examples: $\frac{1}{x-4}$ the EV is $x \neq 4$ or $\sqrt{x}$, the EVs are $x < 0$

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?

the discriminant is the portion of the formula that is under the sq root (b^2-4ac). If the discriminant is > 0 then there are 2 real solutions (zeros). If the discriminant < 0, there are no real zeros, if the discriminant $= 0$, then there is exactly 1 real zero