Precalculus

Write your questions and thoughts here!

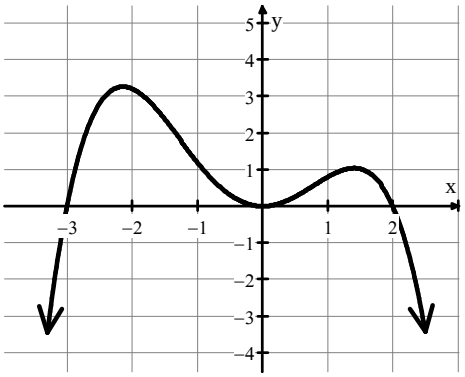
3.2 Extrema & Function Analysis

Name:_____

Absolute max/min – *absolutely* the _____.

Relative max/min – a point on the function that is _____

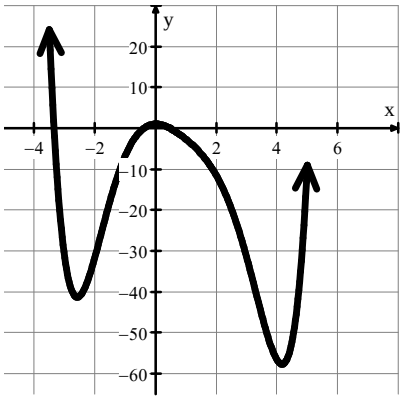
_____.



Finding a max/min means finding the _____ of the point. The x-value helps you with location of the point, but it is not the max/min value.

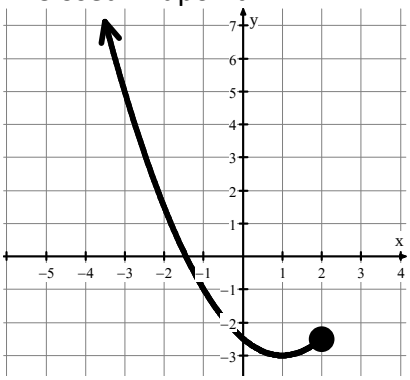
1. Find the coordinate points of the extrema of each function and classify its type.

$$f(x) = 0.05x^6 - 0.25x^5 - 0.25x^4 + 2.25x^3 - 5.4x^2 + 1$$

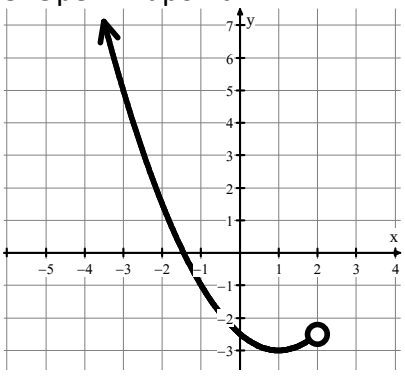


What is the minimum value of f?

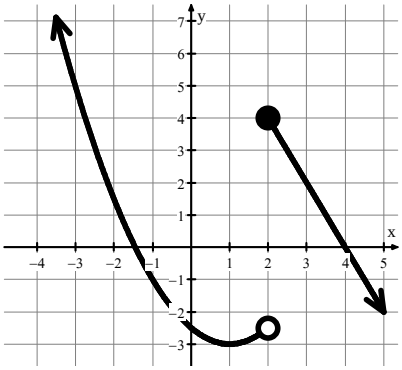
2. Closed Endpoint:



3. Open Endpoint:



3. Jump Discontinuity



3.2 Extrema & Function Analysis

Write your questions and thoughts here!

4. Finding a friendly window.

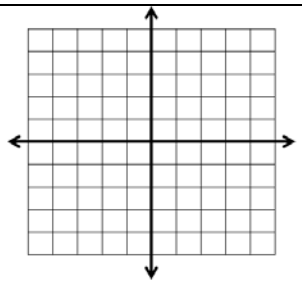
$$f(x) = -100x^3 - 45x^2 + 10x + 5000$$

Function Analysis – putting it all together!

5. $f(x) = 0.5(x^2 + 1)\sqrt{4 - x}$

Domain:	Vertical Asymptotes: (*Nonremovable*)	Holes: (*Removable*)
Absolute max/min value:	Local max/min value(s) that are NOT absolute:	Increasing:
Decreasing:	Left End-Behavior:	Right End-Behavior:

Sketch a graph:



Now summarize what you learned!

Skillz Review: Solve or evaluate.

1. $\sqrt{-125}$	2. $x^2 + 1 = 73$	3. $-9(x + 7)^2 = -144$	4. $5(x - 2)^2 = -60$

3.2 Practice – Extrema & Function Analysis

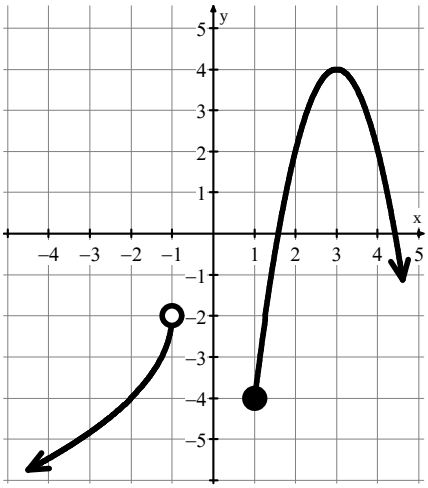
Name: _____

Pre-Calculus

Using the graph and/or the function's equation, find all of the following. Use Interval Notation when describing intervals. Sketch the graph if it is not given.

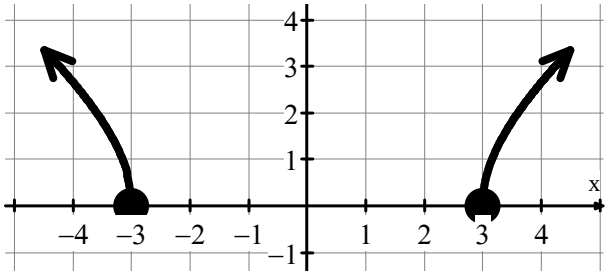
Domain:	Absolute max/min value(s):
Local max/min value(s) that are NOT absolute:	
Increasing:	Decreasing:
Left End-behavior: $\lim_{x\to-\infty} f(x) =$	Right End-behavior: $\lim_{x\to\infty} f(x) =$

1.



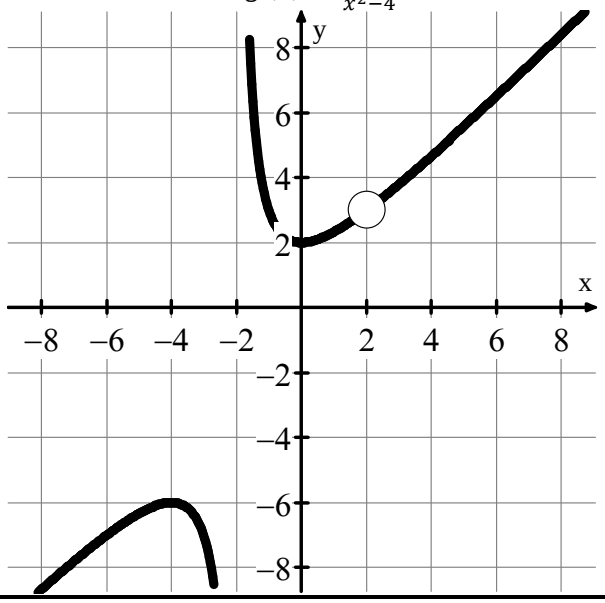
Domain:	Absolute max/min value(s):
Local max/min value(s) that are NOT absolute:	
Increasing:	Decreasing:
Left End-behavior: $\lim_{x\to-\infty} h(x) =$	Right End-behavior: $\lim_{x\to\infty} h(x) =$

2. $h(x) = \sqrt{x^2 - 9}$



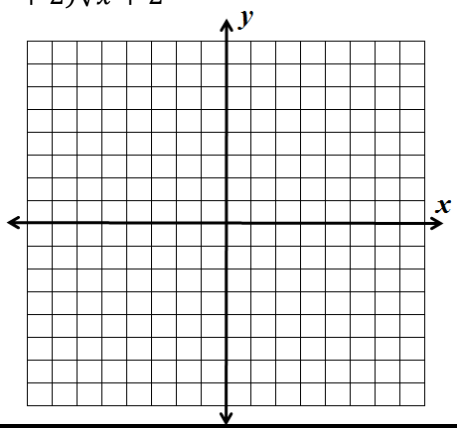
Domain:	Absolute max/min value(s):
Local max/min value(s) that are NOT absolute:	
Increasing:	Decreasing:
Left End-behavior: $\lim_{x\to-\infty} g(x) =$	Right End-behavior: $\lim_{x\to\infty} g(x) =$

3. $g(x) = \frac{x^3-8}{x^2-4}$



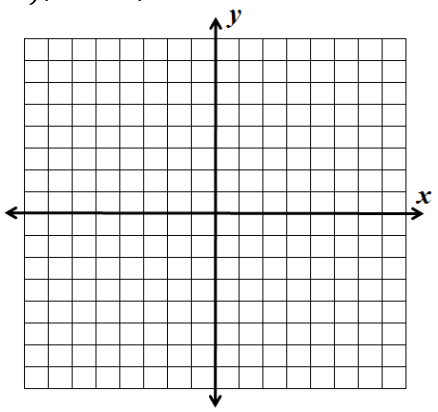
Domain:	Absolute max/min value(s):
Local max/min value(s) that are NOT absolute:	
Increasing:	Decreasing:
Left End-behavior: $\lim_{x\to-\infty} f(x) =$	Right End-behavior: $\lim_{x\to\infty} f(x) =$

4. $f(x) = 0.7(5x^2 + 2)\sqrt{x+2}$



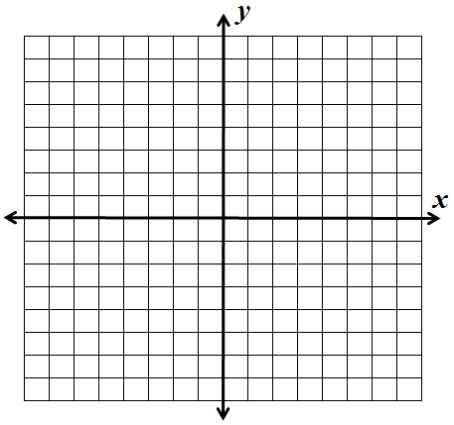
Domain:	Absolute max/min value(s):
Local max/min value(s) that are NOT absolute:	
Increasing:	Decreasing:
Left End-behavior: $\lim_{x\to-\infty} f(x) =$	Right End-behavior: $\lim_{x\to\infty} f(x) =$

5. $g(x) = \frac{1}{2}\left(\sqrt{4-x}\right)|2x-4| + 1$



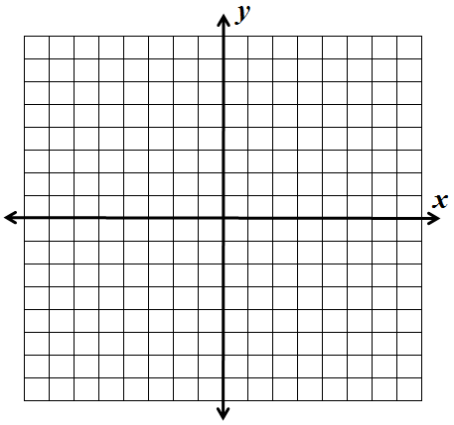
Domain:	Absolute max/min value(s):
Local max/min value(s) that are NOT absolute:	
Increasing:	Decreasing:
Left End-behavior: $\lim_{x\to-\infty} f(x) =$	Right End-behavior: $\lim_{x\to\infty} f(x) =$

6. $f(x) = \frac{x^2-4}{|x-2|}$



Domain:	Absolute max/min value(s):
Local max/min value(s) that are NOT absolute:	
Increasing:	Decreasing:
Left End-behavior: $\lim_{x\to-\infty} f(x) =$	Right End-behavior: $\lim_{x\to\infty} f(x) =$

7. $f(x) = \frac{x^2-1}{\sqrt{x^2-9}}$



3.2 Application and Extension

For 1-2, the extrema are listed for a function *f* along with the restricted domain. Find the absolute maximum value and absolute minimum value on the interval. DON'T USE THE GRAPH!

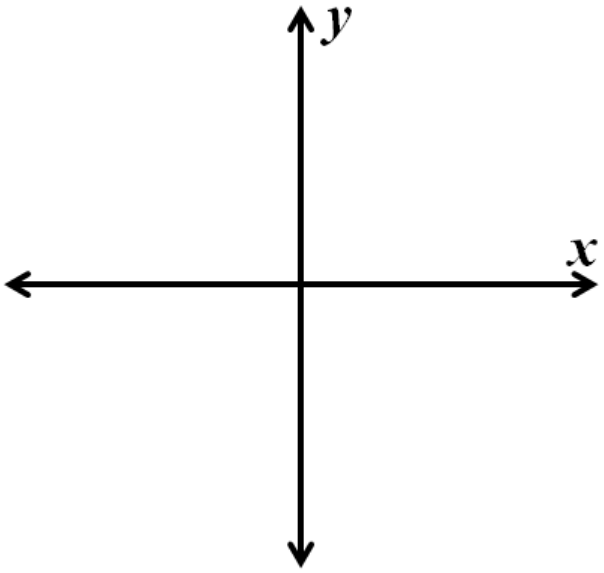
1. $f(x) = 0.7x^3 - 3x^2 + x;\ -1 \le x \le 4$

Extrema at:
$x = 0.178$
$x = 2.679$

2. $f(x) = -21x^4 - 9x^3 + 50x^2 + 13x;$
$-2 \le x \le 1.2$

Extrema at:
$x = -1.204$
$x = -0.127$
$x = 1.01$

3. A rectangle has its base on the x-axis and its two upper corners on the parabola $y = 12 - x^2$.



a. Draw this scenario on the coordinate plane to the right, and draw a possible rectangle.

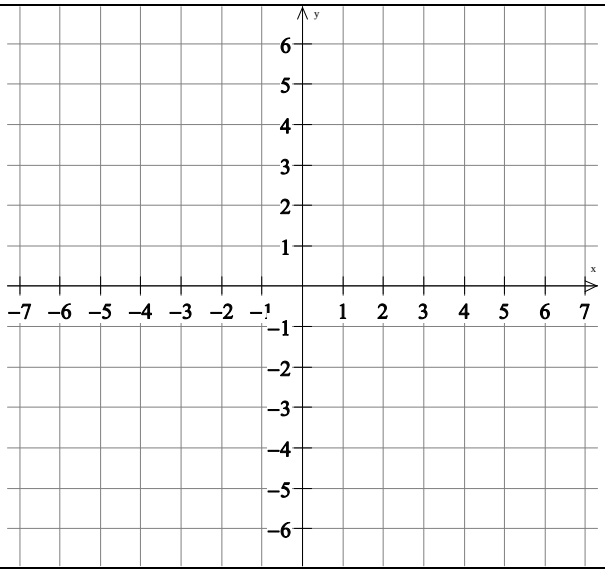
b. Label the base and height of your rectangle in terms of x.

c. Find the function $A(x)$ that represents the area of the rectangle.

d. What is the largest possible area of this rectangle? (*Hint: Use a calculator to graph and find the maximum!*)

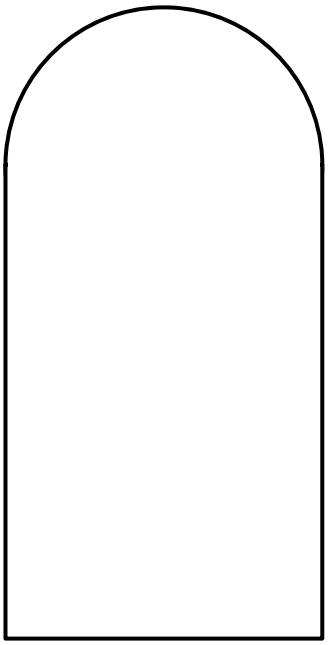
e. At what x-value should the rectangle be drawn for the largest area?

4. Sketch (freehand) a graph of a function g with domain all real numbers that satisfies all of the following conditions:



a. There are no breaks in the graph (it is continuous).
b. g is decreasing on $(-\infty, -3)$ and on $(4, \infty)$
c. g is increasing on $(-1, 4)$
d. $g(4) > g(-7)$
e. $g(x) < 0$ on $(-4, 0)$

5. Mr. Sullivan has hired you to design a window in front of his house. His specifications are that it is to be a rectangular shape with a semi-circle on top (see figure) and the perimeter of the window is 288 inches. He wants you to create a window with the largest possible area that fits those specifications.



a. Using r as the radius of the semi-circle, label the top edge of the semi-circle in terms of r. (*Hint: What is the circumference of a circle?*)

b. Label the bottom of the window in terms of r.

c. Label the height of the rectangular portion as H.

d. Find H in terms of r.

e. Label the area of the semi-circle $a_1(r)$. Find an equation for $a_1(r)$.

f. Label the area of the rectangle $a_2(r)$. Find an equation for $a_2(r)$.

g. Find $A(r)$, the total area of the window.

h. What is the largest area of the window? (3 decimal places and use correct units)

i. What is the width of the bottom of the window to create this large area? (3 decimal places and use correct units)