 12CV Date:____________ Name: ________________________

Curve Sketching Unit - Notes

Tentative TEST date_______________

Big idea/Learning Goals

If you are having trouble figuring out a mathematical relationship, what do you do? Many people find that visualizing mathematical problems is the best way to understand them and to communicate them more meaningfully. Graphing calculators and computers are powerful tools for producing visual information about functions. Similarly, since the derivative of a function at a point is the slope of the tangent to the function at this point, the derivative is also a powerful tool for providing information about the graph of a function. It should come as no surprise, then, that the Cartesian coordinate system in which we graph functions and the calculus that we use to analyze functions were invented in close succession in the seventeenth century. In this unit, you will see how to draw the graph of a function using the methods of calculus, including the first and second derivatives of the function.

Corrections for the textbook answers:

Success Criteria

- ☐ I understand the new topics for this unit if I can do the practice questions in the textbook/handouts

Date	pg	Topics	# of quest. done? You may be asked to show them
	2-3	Increasing and Decreasing intervals 4.1	
	4-7	Critical Points & Local Extremes (first deriv test) 4.2	
	8-9	Asymptotes 4.3	
	10-11	Concavity and Points of Inflections (second deriv test) 4.4	
	12-13	All together 4.5	
		Review	

Reflect – previous TEST mark ___________, Overall mark now___________.

Increasing & Decreasing Intervals

Where Does the Function Increase & Decrease

1.

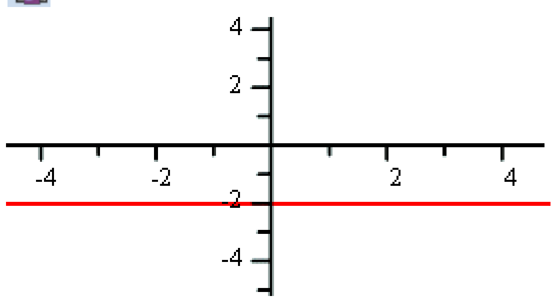
a. Find the intervals of increase and decrease for the function $f(x)=2x^3+3x^2-36x+5$

b. Graph $f'(x)$ and explain how it also indicates intervals of increase and decrease

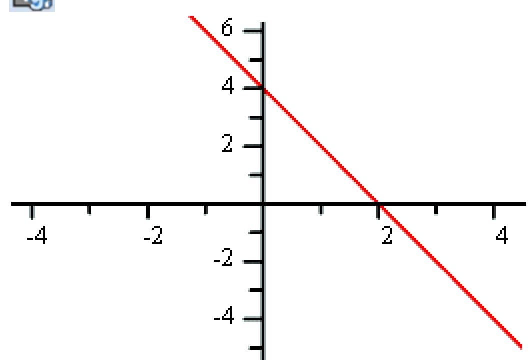
2. Find the intervals of increase and decrease for the function $f(x)=\dfrac{6-2x}{x^2-4}$

3. Use the graphs of the first derivative $f'(x)$ to sketch a possible functions $f(x)$

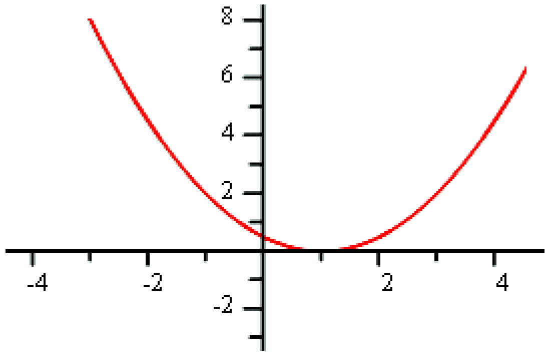
a.



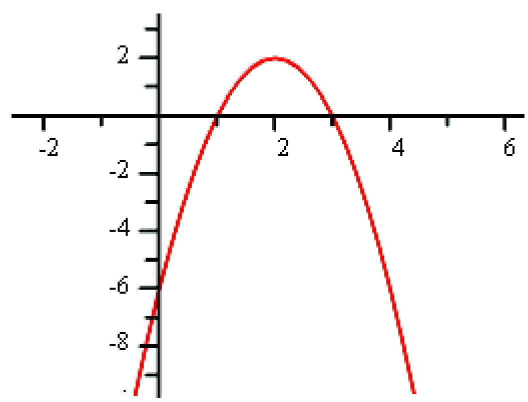
b.



c.

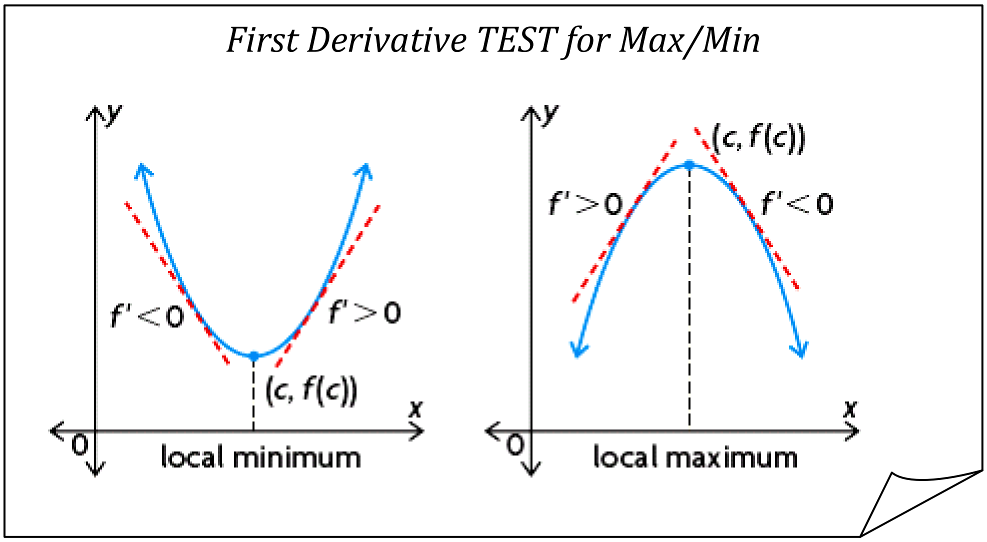


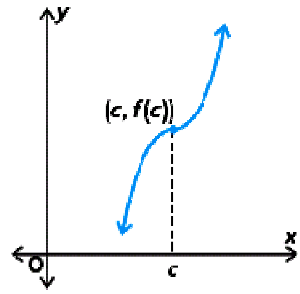
d.

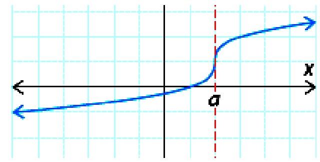


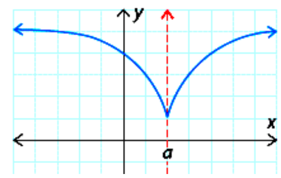
Critical Points & Local Extremes

Critical points









1. Find and classify all the critical points for

a. $y = 2x^3 - 3x^2 - 12x + 5$

b. $y = x - \sqrt{x}$

c. $y=\sqrt[5]{2-x}$

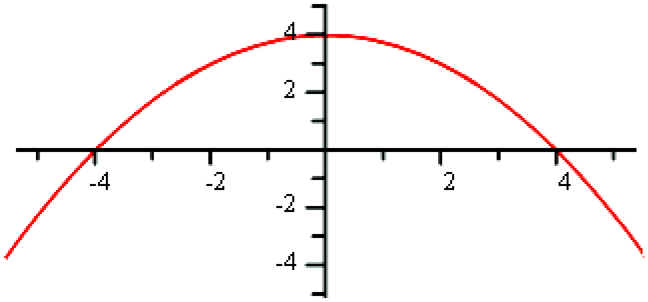
d. $y=(3-2x)^3$

e. $y = \left| x^3 - 2 \right|$

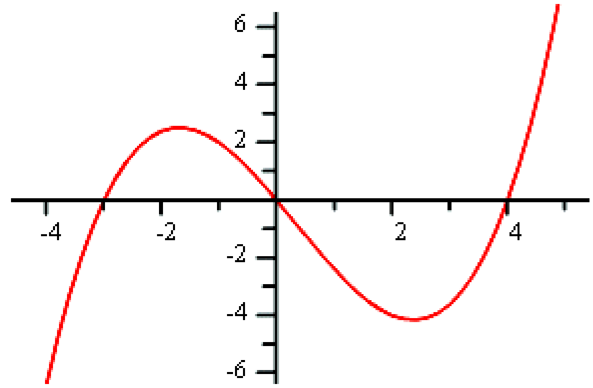
f. $y = \sqrt{\dfrac{1-2x}{x^2-1}}$

2. Draw derivatives of these functions.

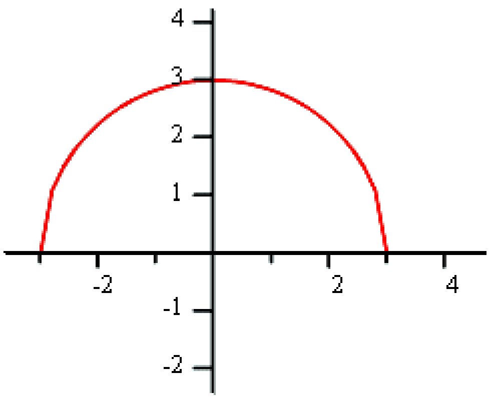
a.



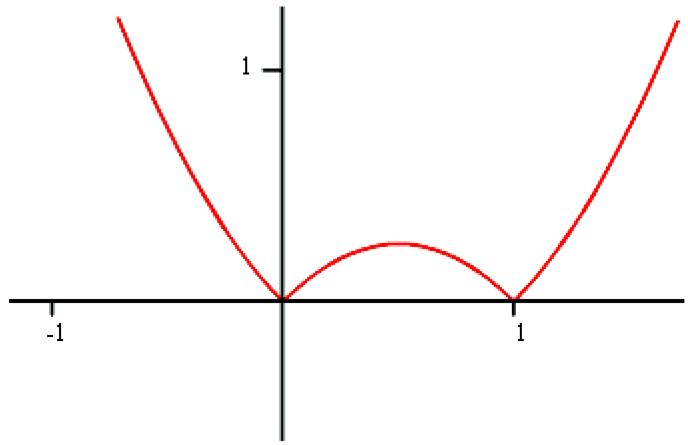
b.



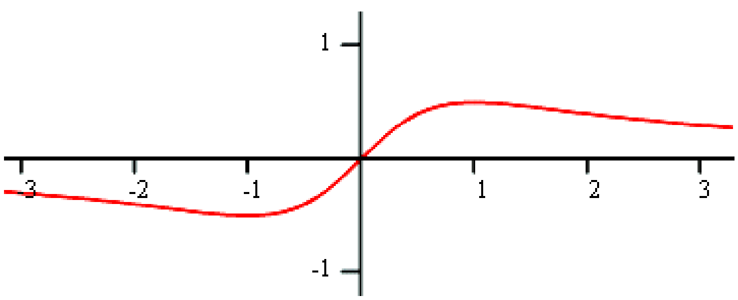
c.



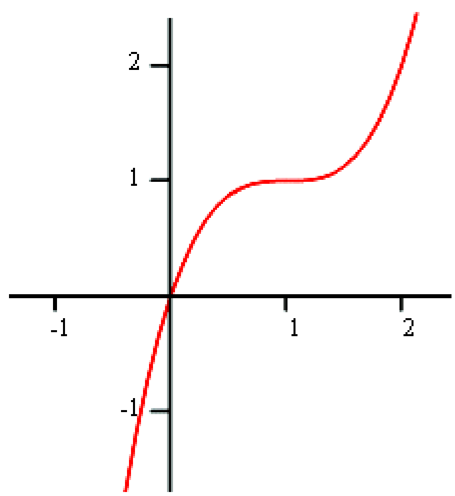
d.



e.



f.



Asymptotes

x-int	*y-int*	*pos/neg intervals*
VA	*OA*	*HA*

Find the asymptotes and sketch what you can of each function

1. $y = \dfrac{2x+4}{3x-6}$

2. $y = \dfrac{1+x^2}{2-x}$

3. $y = \dfrac{2x^2 - 3}{x^2 + 1}$

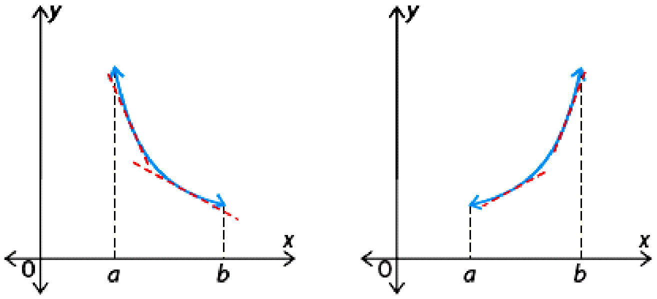
4. $y = \dfrac{4 - x}{x^2 + 2x + 1}$

5. $y = \dfrac{3 - 2x}{x^2 + 6x - 16}$

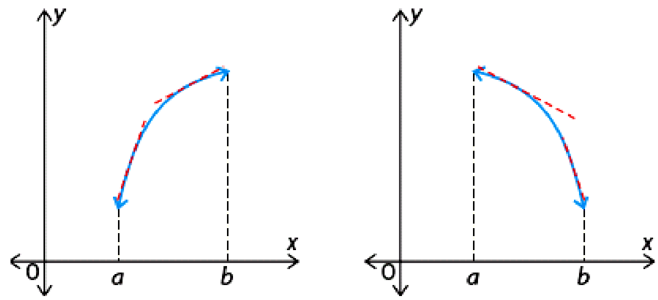
6. $y = \dfrac{4 - x^2}{x + 3}$

Concavity and Points of Inflection

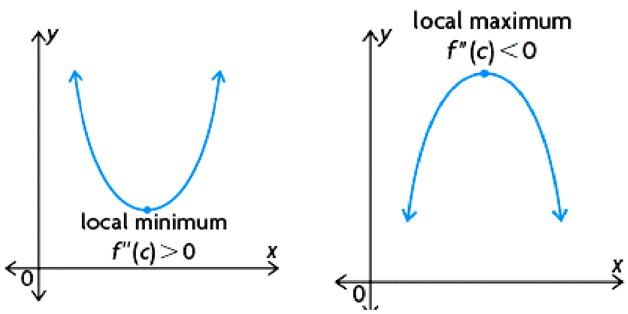
CONCAVE UP –



CONCAVE DOWN –



Second Derivative TEST for Max/Min



Possible and actual
POINT OF INFLECTION:

Three ways of checking if a point is local max/min:

1. Analyze any critical points and points of inflection of $y = \frac{1}{3}x^3 - \frac{5}{2}x^2 + 6x - 1$, then sketch the function.

2. Analyze and sketch $y = \dfrac{2}{x^2 + 4}$

3. Analyze and sketch $y = \sqrt[3]{4x - x^3}$

All Together

from $f(x)$:

- x & y intercepts
- Domain & VA
- OA/HA
- pos/neg intervals

from $f'(x)$:

- Critical points
- inc/dec intervals
- Max/Min values

from $f''(x)$:

- possible Inf.Pt.
- CU/CD intervals
- actual Inf.Pt

At the end, find all y-values of ALL the 'special points' from above in order to plot them accurately.

1. Analyze and sketch $y = \dfrac{4-x}{x^2+2x+1}$

2. Analyze and sketch $y = x^4 - 5x^3 + x^2 + 21x - 18$