May 13, 2014 $\log_b x = y \Leftrightarrow b^y = x$

Solve the following equations:

$49 = \log_7 x$ $4^x = 100$

May 13

Students will verbally explain how to determine properties of the function, its derivative and its second derivative.

(using the words:
positive, negative, increasing, decreasing,
concave up, concave down, etc...)

Function	Vertex	Max/Min	Concavity	Zero of y'	Sign of y"
B. $y=-x^2+8x$	(4, 16)	max	down	x = 4	neg
C. $y=x^2+6x-4$	(-3, -13)	min	up	x = -3	pos
D. $y=-2x^2+4x+1$	(1, 3)	max	down	x = 1	neg

Conjecture 1: Write a statement that relates the derivative and the max/min of a function. where is.

Conjecture 2: Write a statement that relates the second derivative and the concavity of a function.

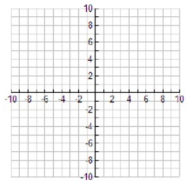
Conjecture 3: Write a statement that relates the sign of the second derivative and whether the zero of the first derivative is a max/min of the function.

Find the vertex and concavity of the following functions using what you have learned about the first and second derivatives.

Function	$\frac{dy}{dx}$	zero of $\frac{dy}{dx}$	Vertex of y	$\frac{d^2y}{dx^2}$	Sign of $\frac{d^2y}{dx^2}$	Vertex of y is max/min
E. $y=x^2-3x$						
F $y=-2x^2+8x+1$						

II. Increasing/Decreasing Functions

Example A. Consider $y=x^2-5x-1$. Use the graph of the function to determine the following; you may use the max/min function on the calculate menu to speed the process. Graph and label y on the grid below.



For which interval(s) is y increasing (use x-values to write intervals)? _____

For which interval(s) is y decreasing (use x-values to write intervals)? _____

Find $\frac{dy}{dx}$:_____ Graph and label it on the grid above.

What is the sign of $\frac{dy}{dx}$ on the interval(s) for which y is increasing? _____

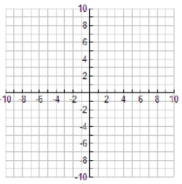
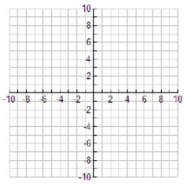
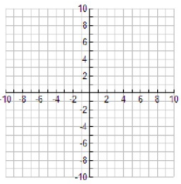
What is the sign of $\frac{dy}{dx}$ on the interval(s) for which y is decreasing? _____

Note--I am asking for the sign of the y-values on a particular intervals of x-values: choose an x-value in the interval and replace that value for x in the derivative to determine the sign of y-values of the derivative for that interval of x-values or use the graph of the derivative to determine the sign.

Using Example A in this section, predict the sign of $f'(x)$ after finding the interval(s) for which $f(x)$ is increasing/decreasing graphically.
Then, graph and label each function and its derivative on the corresponding grid.

Function	Interval(s) for which $f(x)$ is increasing	Sign of $f'(x)$	Interval(s) for which $f(x)$ is decreasing	Sign of $f'(x)$	$f'(x)$
B. $f(x) = -x^2 + 2x$					
C. $f(x) = x^2 + 6x + 5$					
D. $f(x) = -x^2 + 10x$					

B. C. D.

Conjecture 4: Write a statement that relates the sign of the first derivative and whether the function increases or decreases.

critical point		
sign of f'		
behavior of f		