§3.6: f, f', and f'' graphs
"I WILL …
…understand the differences between these three graphs."

I. Fill in the blank table

f	Increasing	Critical Points, Possible Extrema	Decreasing	Concave Up	Possible Points of Inflection	Concave Down
f'						
f''						
Tangent Line						

II. Graphing a Derivative's Graph

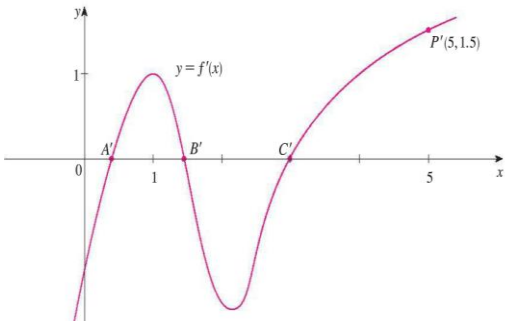
A. Apply the equation, _____to determine the derivative

B. Identify the zero slopes of the original function or the highest and lowest (also known as peaks and valley) points of the derivative graph

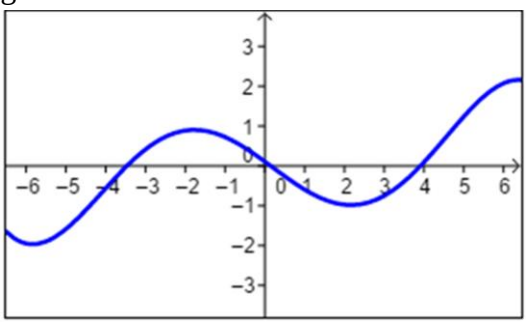
C. Sketch based on the slope based on the __-AXIS from the original function

1. POSITIVE Slope: _____ the x-axis (Increasing)
2. NEGATIVE Slope: _____ the x-axis (Decreasing)

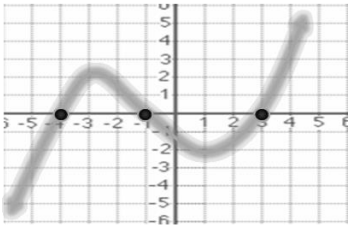
Ex 1: Sketch a possible f graph of the function given.



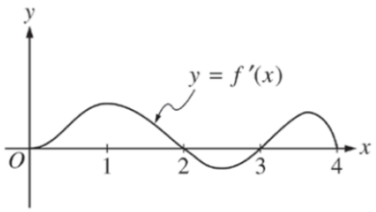
Ex 2: Sketch a possible f graph of the function given.



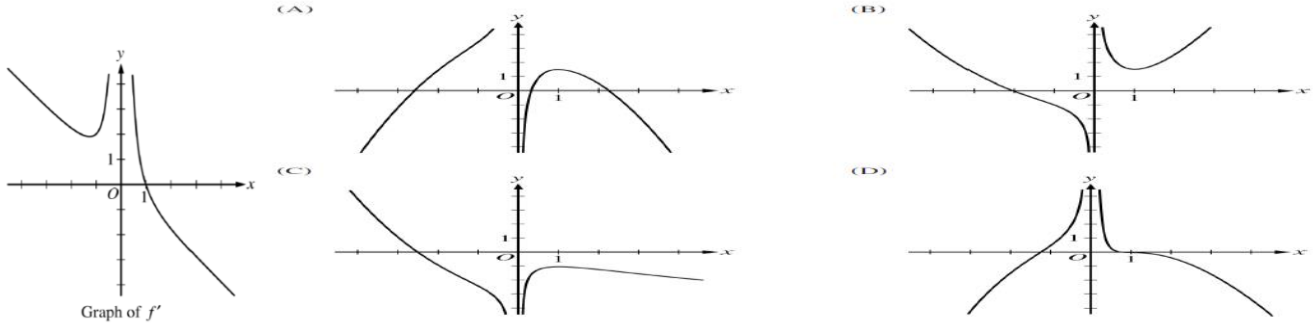
Your Turn: Sketch a possible f graph of the function given.



Ex 3: The figure below shows the graph of f', the derivative of f. If $f(0) = 0$, which of the following could be a graph of f?



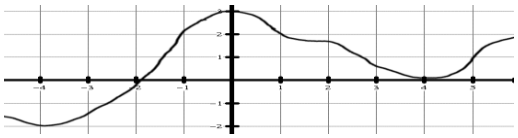
Your Turn: The figure below shows the graph of f', the derivative of f. Which of the following could be a graph of f?



III. Direction of a derivative from a graph

A. A graph which is differentiable is continuous
B. A graph which is continuous, is not always differentiable
C. A graph is neither continuous or differentiable is discontinuous
   1. Hole
   2. Vertical Asymptotes
   3. Jump discontinuities
   4. Kinks/Cusps

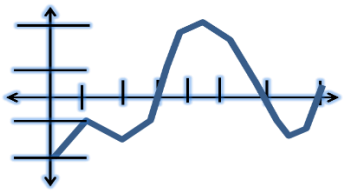
Ex 4: Given this graph of $y = f'(x)$ below.



(a) On what intervals of which f is increasing and decreasing?

(b) At which of the x values have a local max and values of local min?

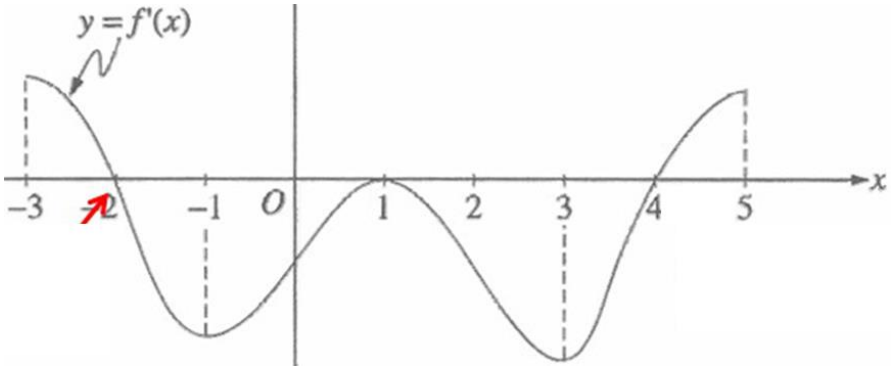
Your Turn: Given this graph of $y = f'(x)$ below.



(a) On what intervals of which f is increasing and decreasing?

(b) At which of the x values have a local max and values of local min?

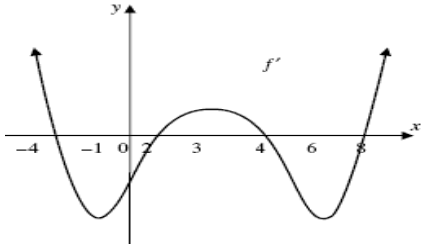
Ex 5: Given this graph of $y = f'(x)$ below.



(a) On what intervals of which f is concaving up and concave down?

(b) At which of the x values correspond to the possible of inflection points?

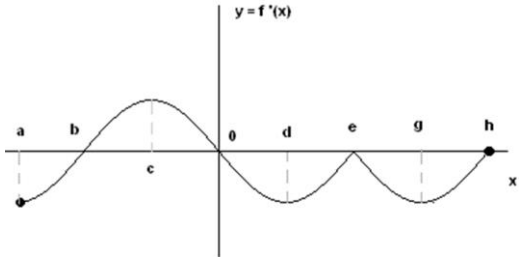
Ex 6: Given this graph of $y = f'(x)$ below.



(a) On what intervals of which *f* is concaving up and concave down?

(b) At which of the *x* values correspond to the possible of inflection points?

Ex 7: Given this graph of $y = f'(x)$ below.

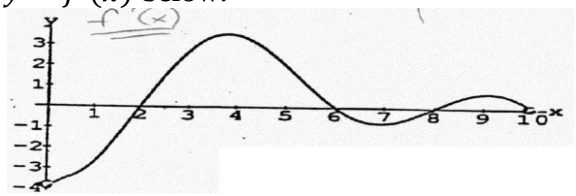


(a) At what values does f have a local maximum and/or a local minimum?

(b) On what intervals of which f is concaving up and concave down?

(c) At which of the x values correspond to the possible of inflection points?

Your Turn: Given this graph of $y = f'(x)$ below.



(a) At what values does f have a local maximum and/or a local minimum?

(b) On what intervals of which f is concaving up and concave down?

(c) At which of the x values correspond to the possible of inflection points?

Ex 8: Let f be a function that is even and continuous on the closed interval $[-3, 3]$. The function f and its derivatives have the properties indicated in the table below:

x	0	$(0, 1)$	1	$(1, 2)$	2	$(2, 3)$
$f(x)$	1	Positive	0	Negative	-1	Negative
$f'(x)$	Undefined	Negative	0	Negative	Undefined	Positive
$f''(x)$	Undefined	Positive	0	Negative	Undefined	Negative

(a) Find the x-coordinate of each point at which f attains an absolute max value or an abs. min value. For each x-coordinate you give, state whether f attains an abs. max or abs. min.

(b) What are the x–coordinates of all points of inflection $f(x)$ on the graph of f. Justify.

Your Turn: A function $f(x)$ is continuous on the closed interval $[-3,\ 3]$ such that $f(-3) = 4$ and $f(3) = 1$. The functions $f'(x)$ and $f''(x)$ have properties in the table below:

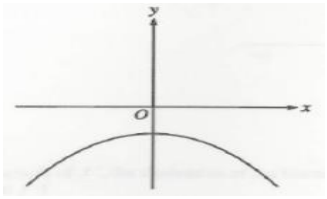
x	$(-3,-1)$	$x=-1$	$(-1,1)$	$x=1$	$(1,3)$
$f'(x)$	Positive	Fails to Exist	Negative	0	Negative
$f''(x)$	Positive	Fails to Exist	Positive	0	Negative

(a) What are the x-coordinates for all absolute maximum and minimum points of $f(x)$ on the interval $[-3,3]$?

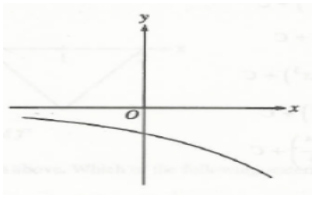
(b) What are the x–coordinates of all points of inflection $f(x)$ on the graph of f on the interval $[-3,3]$. Justify.

AP1) The function f has the property that $f(x)$, $f'(x)$, $f''(x)$ are negative for all real values of f. Which of the following could be the graph of f?

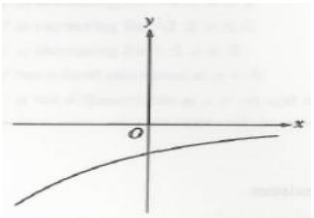
(A)



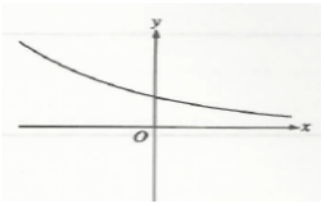
(B)



(C)



(D)



Vocabulary	Process and Connections	Answer and Justifications

Assignment: Worksheet