Key

Math 4 Name ____________

5-6 Learn Check Date ________

I can use derivatives to analyze functions.

1. Consider the equation $f(x) = \frac{1}{4}x^4 + x^3 + 2$

1a. Determine the points where there are maximums, minimums, or "flat spots".

$f' = 0$

$f'(x) = x^3 + 3x^2$

$0 = x^2(x+3)$

$\boxed{x = 0 \quad x = -3}$

x^2	+	+	+
$x+3$	−	+	+

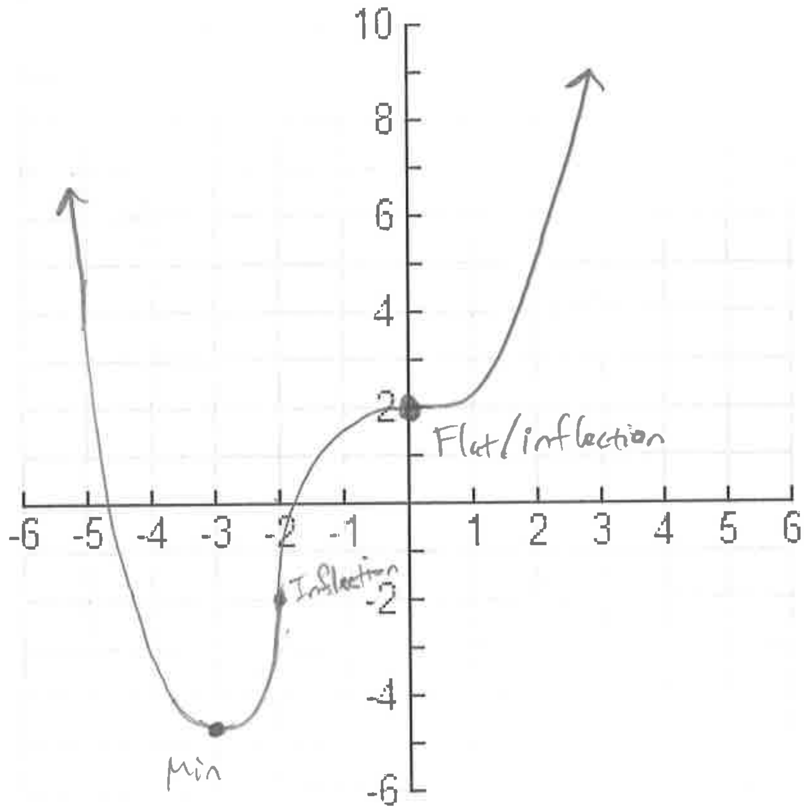
− -3 + 0 +

flat

1b. Find the coordinates of the maximums, minimums, and "flat spots"

$(0, 2)$ $f(0) = 2$

$(-3, -4.75)$ $f(-3) = -4.75$



1c. Determine the concavity of $f(x)$. Your answer should be intervals.

$f''(x) = 3x^2 + 6x$

$0 = 3x(x+2)$

$x = 0 \quad x = -2$

$3x$	−	−	+
$x+2$	−	+	+

+ -2 − 0 +

up down up

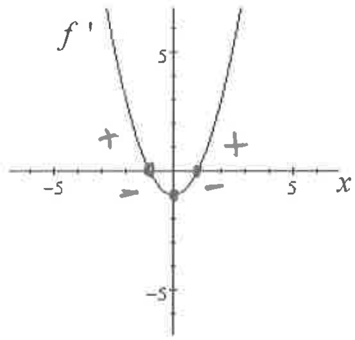
1d. Find the coordinates of the inflection point(s) of $f(x)$.

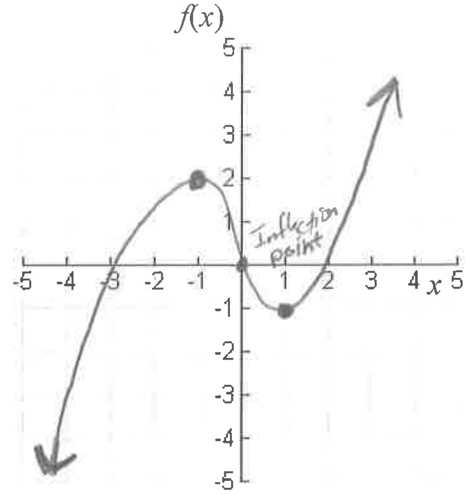
$(-2, -2)$ $f(-2) = -2$

$(0, 2)$ $f(0) = 2$

1e. Sketch the graph of $f(x)$ based on the above information. Label all points you found above. DO NOT USE YOUR CALCULATOR!!

2. The graph below is of $f'(x)$, the first derivative.
This is not the graph of $f(x)$. If $f(-1) = 2$, $f(1) = -1$
and $f'(x)$ is represented by the given graph.
Graph $y = f(x)$ as best you can. Label all inflection points



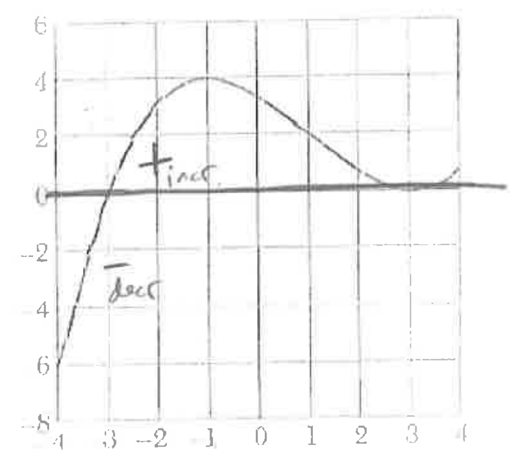


Max: $(-1, 2)$
Min: $(1, -1)$
Inflection: $x = 0$

f increasing: $x < -1$ + $x > 1$
f decreasing: $-1 < x < 1$

3. The graph of the derivative of a function f appears below. [NOTE: The graph of f is not shown.]

Graph of f'



(a) Where does f have stationary points?
(b) Where does f have local maxima? Local minima? Points of inflection?
Justify your answers to both parts (a) and (b) with reasoning

a) At $x = -3$ + $x = 3$
These are the points where the derivative is 0.

b) Minimum: $x = -3$
Max: None

Points of inflection: $x = -1$ + $x = 3$
These are the local max/mins of f'.