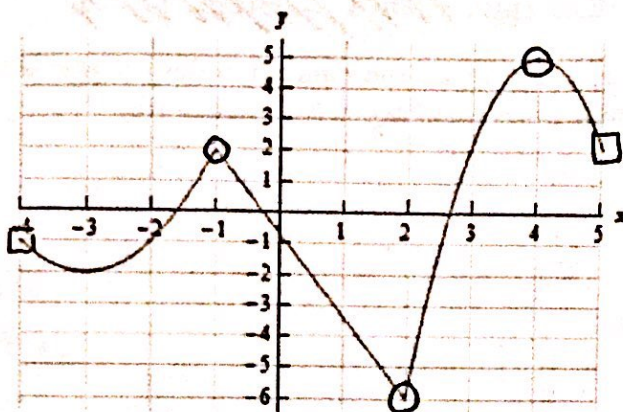## Group Work

1. Identify all of the relative extrema and absolute extrema of the function $f(x)$ graphed below. What is $f'$ at each relative extremum?



**Note:** $\square$'s are not local/relative mins, but are candidates for absolute max & mins

Relative min(s):
$$(2, -6) \Rightarrow f'(2) \text{ D.N.E.}$$

Relative max(s):
$$(-1, 2) \Rightarrow f'(-1) \text{ D.N.E}$$
$$(4, 5) \Rightarrow f'(4) = 0$$

Absolute min:
$$(2, -6)$$

Absolute max:
$$(4, 5)$$

2. Determine the absolute extrema of $f(x) = -2x^5 + 5x^4 + 80x^3 + 1$ on the interval $[0, 7]$.

$$f'(x) = -10x^4 + 20x^3 + 240x^2$$
$$= -10x^2(x^2 + 2x - 24)$$
$$= -10x^2(x-6)(x+4) = 0$$

local Candidates $\Rightarrow x = 0, 6, [-4] \Rightarrow$ Not in $[0,7]$)

endpt. candidates $\Rightarrow x = 0, 7$

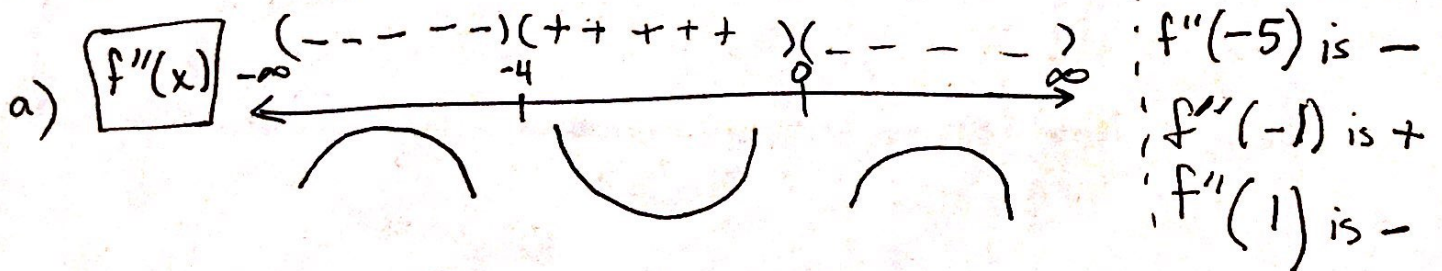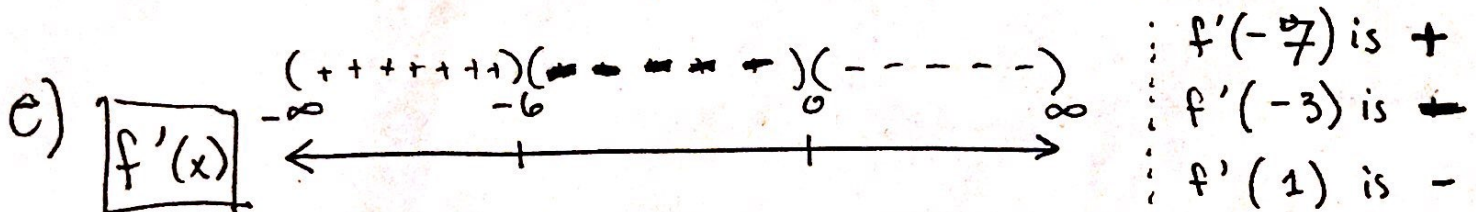| $x$ | $f(x)$ |
|-----|--------|
| 0 | 1 |
| 6 | ~~8209~~ 8209 |
| 7 | 5832 |

absolute min at $(0, 1)$

absolute max at $(6, 8209)$

2

3. For $f(x) = -x^4 - 8x^3 + 5$, answer the following questions:

(a) Determine the intervals on which the function is concave up and concave down.

(b) Determine the inflection points of the function.

(c) Identify the critical points of the function.

(d) Classify the critical points as relative maximums, relative minimums or neither using the Second Derivative Test.

(e) Determine the intervals on which the function increases and decreases.

(f) Use the information from steps (a) – (e) to sketch the graph of the function. (Use the back of this sheet as needed.)

b) $f'(x) = -4x^3 - 24x^2 = -4x^2(x+6) \Rightarrow x = 0, -6$

c) $f''(x) = -12x^2 - 48x = -12x(x+4) \Rightarrow x = 0, -4$

e) $\boxed{f'(x)}$

$(+ + + + + +)(- - - - - -)(- - - - -)$
$-\infty \qquad -6 \qquad\qquad 0 \qquad\qquad \infty$

$f'(-7)$ is $+$
$f'(-3)$ is $-$
$f'(1)$ is $-$

a) $\boxed{f''(x)}$

$(- - - - - -)(+ + + + +)(- - - - -)$
$-\infty \qquad -4 \qquad\qquad 0 \qquad\qquad \infty$

$f''(-5)$ is $-$
$f''(-1)$ is $+$
$f''(1)$ is $-$

d) $f''(0)$ is neither $+/-$,
$f''(-6)$ is negative
so ~~int form~~, a rel.
max at $x = -6$.
(i.e. at $(-6, \ )$)

f.)



$-6 \ -4$

inflection pt
at $x = -4$

3