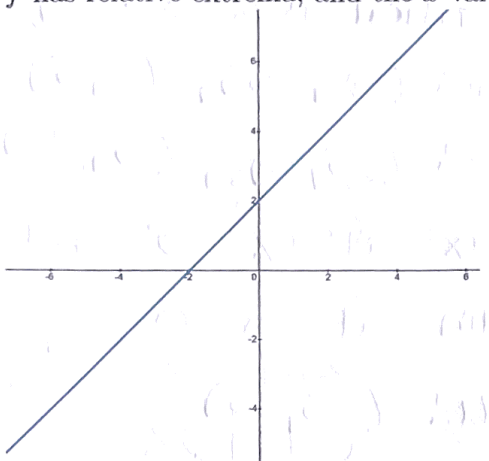
Graphical Interpretation of Derivatives

Example 1: The graph of $f'(x)$ is given below. Find the critical numbers for $f(x)$, the intervals on which f is increasing, decreasing, concave up, concave down, the x-values at which f has relative extrema, and the x-values at which f has inflection points.



$f'(x)$ $- \; - \; - \; 0 \; + \; + \; + \; + \; + \; +$ (at -2)

$f''(x)$ $+ \; + \; + \; + \; + \; + \; + \; + \; +$

Critical #'s: $-2 = x$

Inc: $(-2, \infty)$

Dec: $(-\infty, -2)$

Max: none

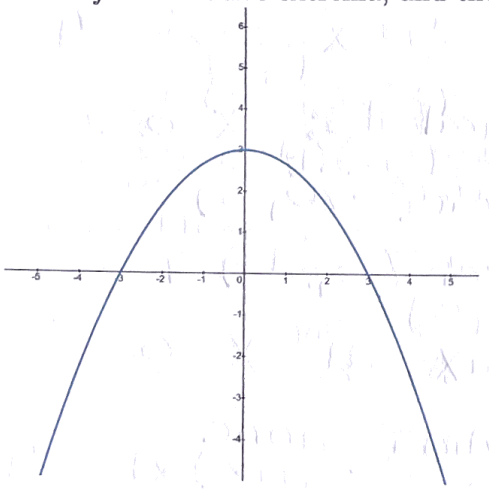
min: $x = -2$

CU: $(-\infty, \infty)$

CD: none

I.P.: none

Example 2: The graph of $f'(x)$ is given below. Find the critical numbers for $f(x)$, the intervals on which f is increasing, decreasing, concave up, concave down, the x-values at which f has relative extrema, and the x-values at which f has inflection points.



$f'(x)$ $- \; 0 \; + \; + \; + \; + \; 0 \; -$ (at -3 and 3)

$f''(x)$ $+ \; + \; + \; + \; 0 \; - \; - \; - \; -$ (at 0)

Critical #s: $x = \pm 3$

Inc: $(-3, 3)$

Dec: $(-\infty, -3), (3, \infty)$

Max at $x = 3$

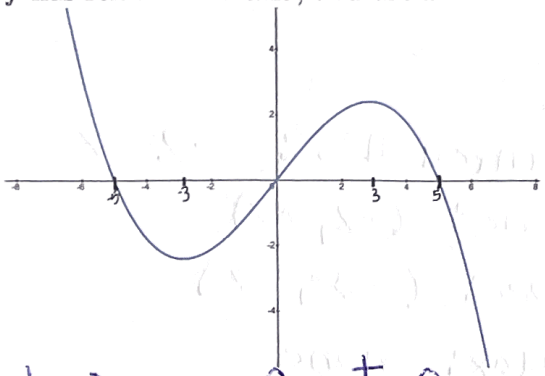
min at $x = -3$

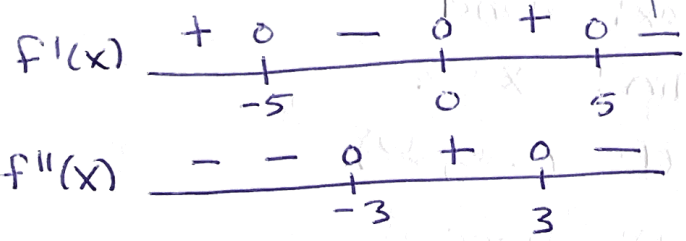
CU: $(-\infty, 0)$

CD: $(0, \infty)$

I.P. at $x = 0$

Example 3: The graph of $f'(x)$ is given below. Find the critical numbers for $f(x)$, the intervals on which f is increasing, decreasing, concave up, concave down, the x-values at which f has relative extrema, and the x-values at which f has inflection points.





Critical #s: $x = -5, 0, 5$

Inc: $(-\infty, -5)$, $(0, 5)$

Dec: $(-5, 0)$, $(5, \infty)$

max at $x = -5$ and $x = 5$

min at $x = 0$

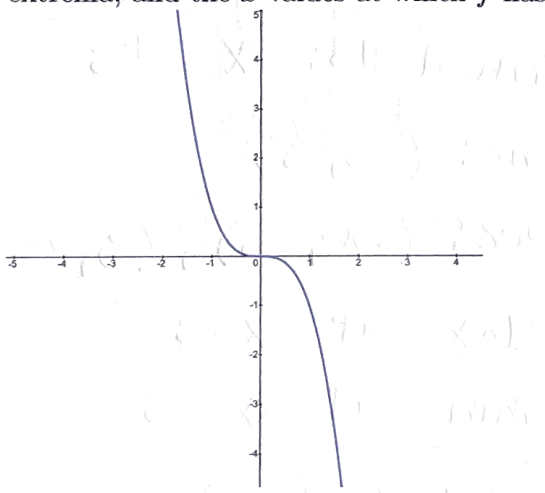
CU: $(-3, 3)$

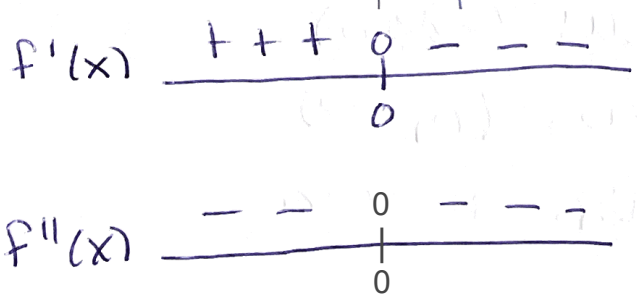
CD: $(-\infty, -3)$, $(3, \infty)$

I.P. at $x = -3$ and $x = 3$

DIY

The graph of $f'(x)$ is given below. Find the critical numbers for $f(x)$, the intervals on which f is increasing, decreasing, concave up, concave down, the x-values at which f has relative extrema, and the x-values at which f has inflection points.





Critical #s: $x = 0$

Inc: $(-\infty, 0)$

Dec: $(0, \infty)$

max at $x = 0$

min: none

CU: none

CD: $(-\infty, \infty)$

IP: none