- Find all critical numbers and state the open intervals on which f is increasing and/or decreasing.
- Find all inflection points and state the open intervals on which f is concave up and/or concave down.
- Use these results to determine all relative and absolute extrema.

3.3

16. $f(x) = x^3 - 6x^2 + 15$

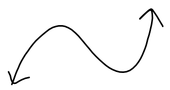
$f'(x) = 3x^2 - 12x$

$3x(x-4) = 0$

critical #'s : 0, 4

$f'(-1)$, $f'(1)$, $f'(5)$

$+ \quad 0 \quad - \quad 4 \quad +$



f is increasing on $(-\infty, 0) \cup (4, \infty)$

f is decreasing on $(0, 4)$

f has a relative maximum @ $(0, 15)$

f has a relative minimum @ $(4, (4)^3 - 6(4)^2 + 15)$ $= (4, -17)$

$f'(x) = 3x^2 - 12x$

$f''(x) = 6x - 12$

$6(x-2) = 0$

$x = 2$

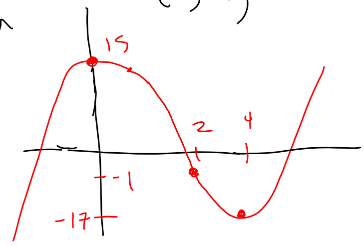
$f''(0)$, $f''(5)$

$- \quad 2 \quad +$

f is concave down on $(-\infty, 2)$ &

f is concave up on $(2, \infty)$.

f has an inflection point @ $(2, -1)$



3.3

30. $f(x) = \dfrac{x+3}{x^2}$

$\frac{d}{dx}\left((x+3)/(x^\wedge 2)\right) = \dfrac{-(x+6)}{x^3}$

critical #'s : -6, 0

$f'(-8)$, $f'(-4)$, $f'(4)$

$- \quad -6 \quad + \quad 0 \quad -$

f is decreasing on $(-\infty, -6) \cup (0, \infty)$

f is increasing on $(-6, 0)$

f has a relative minimum @ $(-6, -1/12)$

f has no relative maximum

$f''(x) = \dfrac{2(x+9)}{x^4}$

$f''(-10)$, $f''(-1)$, $f''(1)$

$- \quad -9 \quad + \quad 0 \quad +$

f is concave down on $(-\infty, -9)$

f is is concave up on $(-9, 0) \cup (0, \infty)$

f has an inflection point @ $(-9, -2/27)$