(3) $f(x) = 3x^4 + 10x^3 - 12x^2 - 30$ ← USE THIS FUNCTION

$\Rightarrow f'(x) = 12x^3 + 30x^2 - 24x$

$\Rightarrow f''(x) = 36x^2 + 60x - 24$

* Find Critical Values

TYPE I: $f'' = 0$

$\Rightarrow 36x^2 + 60x - 24 = 0$

multiply thru by $\frac{1}{12}$

$\Rightarrow 3x^2 + 5x - 2 = 0$

$\Rightarrow (3x - 1)(x + 2) = 0$

$\Rightarrow 3x - 1 = 0$ or $x + 2 = 0$

$\Rightarrow x = \frac{1}{3}$ or $x = -2$

TYPE II: f'' D.N.E

NONE (polynomial)

$\Rightarrow$ or, using the quadratic formula

$$x = \frac{-5 \pm \sqrt{(5)^2 - 4(3)(-2)}}{2(3)}$$

$$= \frac{-5 \pm \sqrt{25 + 24}}{6}$$

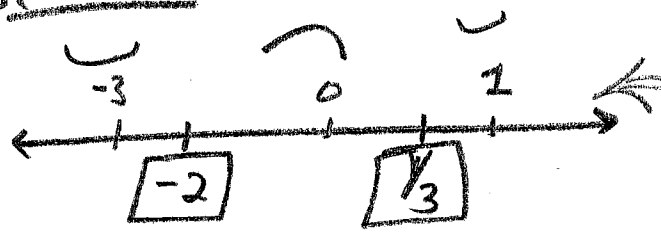
$$= \frac{-5 \pm \sqrt{49}}{6}$$

$$= \frac{-5 \pm 7}{6} \text{ or } = \frac{-5 - 7}{6}$$

$$= \frac{2}{6} \qquad = \frac{-12}{6}$$

$$= \frac{1}{3} \text{ or } \qquad = -2$$

so we have:



$f''(-3) = 36(-3)^2 + 60(-3) - 24$

$= 324 - 180 - 24$

$= 240 > 0 \Rightarrow f$ is ∪

$f''(0) = 36(0)^2 + 60(0) - 24$

$= 0 + 0 - 24$

$= -24 < 0$ so f is ∩

$f''(1) = 36(1)^2 + 60(1) - 24$

$= 36 + 60 - 24$

$= 72 > 0 \Rightarrow f$ is ∪

so f is ∪ on $(-\infty, -2)$, $(\frac{1}{3}, \infty)$

f is ∩ on $(-2, \frac{1}{3})$

$f(-2) = 3(2)^4 + 10(2)^3 - 12(2)^2 - 30$

$= 5$

$f(\frac{1}{3}) = 3(\frac{1}{3})^4 + 10(\frac{1}{3})^3 - 12(\frac{1}{3})^2 - 30$

≈ -30.93

Inflection points at: $(-2, 5)$ and $(\frac{1}{3}, -30.93)$