I didn't show you how to use Test Values. Also, I always lay out the intervals as intervals, rather than compound inequalities.

Recall, we were working on

$$f(x) = 3x^4 - 4x^3 - 12x^2 + 5$$

$\Rightarrow f'(x) = 12x^3 - 12x^2 - 24x \overset{\text{SET}}{=} 0$

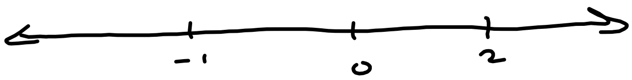
$\Rightarrow 12x(x^2 - x - 2) = 0$

$\Rightarrow 12x(x-2)(x+1) = 0$

$\Rightarrow x = -1, 0, 2$ (CRITICAL #s)

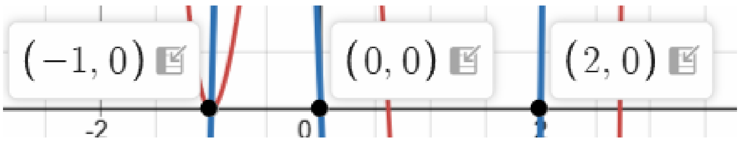
$12x^3$ $-$ $+$ End Behavior

Use $g(x)$ for $f'(x)$ on Desmos.



Interval	Test
$(-\infty, -1)$	-2
$(-1, 0)$	$-\frac{1}{2}$
$(0, 2)$	1
$(2, \infty)$	3

Snapshot of the zeros of f'.



$f(x) = 3x^4 - 4x^3 - 12x^2 + 5$

$g(x) = 12x^3 - 12x^2 - 24x$

$f(0) = 5$

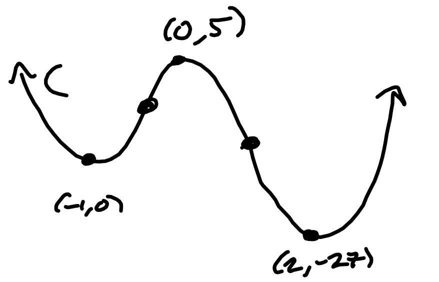
$f(-1) = 0$

$f(2) = -27$

(0,5) MAX

(−1,0) MIN

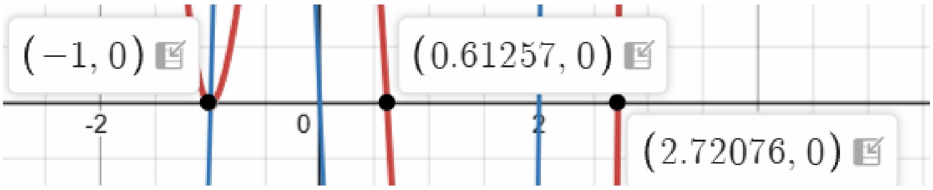
(2,−27) MIN



From 1^{st} Derivative.

Now let's see the influence of the 2^{nd} derivative.

Snapshot of the zeros of f.



$f'(x) = 12x^3 - 12x^2 - 24x \longrightarrow$

$f''(x) = 36x^2 - 24x - 24$ SET 0

$\longrightarrow 12(3x^2 - 2x - 2) = 12(3x \quad)(x \quad)$ DOH!

$2 \,|\, 28$
$2 \,|\, 14$
7

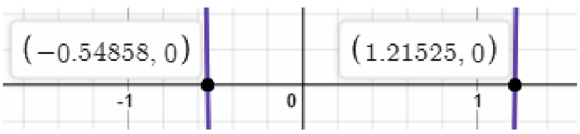
$b^2 - 4ac = 2^2 - 4(3)(-2) = 4 + 24 = 28$

$\longrightarrow x = \dfrac{-b \pm \sqrt{b^2-4ac}}{2a} = \dfrac{2 \pm \sqrt{28}}{2(3)} = \dfrac{2 \pm 2\sqrt{7}}{6}$

$= \dfrac{1 \pm \sqrt{7}}{3}$ → $\dfrac{1+\sqrt{7}}{3} \approx$; $\dfrac{1-\sqrt{7}}{3} \approx$

Snapshot of the zeros of f''.

$f''(x) = 36\left(x - \left(\frac{1+\sqrt{7}}{3}\right)\right)\left(x - \left(\frac{1-\sqrt{7}}{3}\right)\right)$



Confirming our hand work.

$h(x) = 36x^2 - 24x - 24$

$\dfrac{(1+\sqrt{7})}{3} = 1.21525043702$

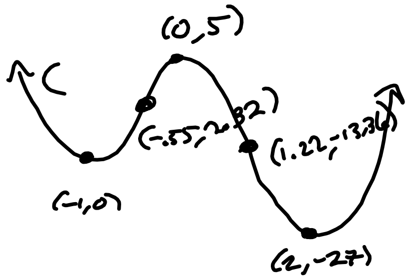
$\dfrac{(1-\sqrt{7})}{3} = -0.548583770355$

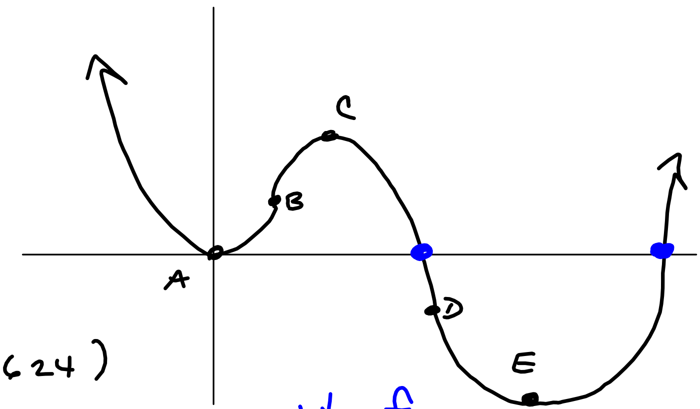
$f(1.21525043702) = -13.3577816624$

$(1.2152504, -13.3577816624)$

$f(-.548583770355) = 2.32074462538$

$(-.5486, 2.3207446)$



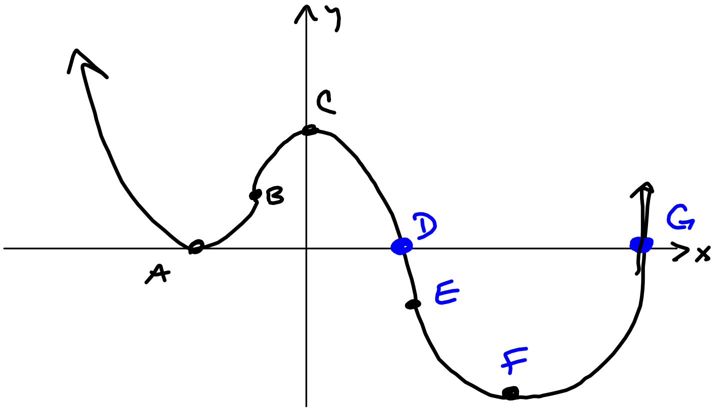


(1.2152504, -13.3577816624)

(-.5486, 2.3207446)

x-ints of
f(x) are the
part calculus doesn't
help us with

"COMPLETE GRAPH"
includes everything:
x-ints
MAX/MIN
Asymptotes
Inflection Points (Concavity)



A = (-1,0) MIN
B = (-.55, 2.32) IP
C = (0,5) MAX
D = (.61,0) x-INT (TECH)
E = (1.22, -13.36) IP
F = (2, -27) MIN.
G = (2.72, 0) x-INT

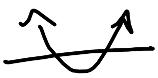
I didn't really analyze the *f* '' for sign changes. I just knew it was a polynomial, and this is what they look like.

here's the f'' analysis: Test

$\left(-\infty, \frac{1-\sqrt{7}}{3}\right) \approx (-\infty, -.55)$

$\left(\frac{1-\sqrt{7}}{3}, \frac{1+\sqrt{7}}{3}\right) \approx (-.55, 1.22)$

$\left(\frac{1+\sqrt{7}}{3}, \infty\right) \approx (1.22, \infty)$

f'' is quadratic Polynomial 

f'' + | − | +

$\frac{1-\sqrt{7}}{3}$ $\frac{1+\sqrt{7}}{3}$