4. $f(x) = x^3 + 9x^2 + 6x - 12$

FIND POINTS OF INFLECTION

① FIND 2ND DERIVATIVE

$f'(x) = 3x^2 + 9 \cdot 2x + 6$

$= 3x^2 + 18x + 6$

$f''(x) = 3 \cdot 2x + 18$

$= 6x + 18$

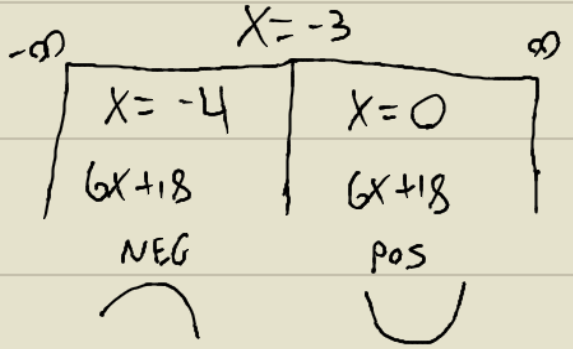
② SET THIS EQUAL TO ZERO AND SOLVE "CRITICAL #'S"

$6x + 18 = 0$

$6x = -18$

$x = -3$

③ USING CRITICAL #'S BUILD A TABLE OF INTERVALS, PICK TEST CASES, PLUG INTO 2ND DERIV AND DETERMINE CONCAVITY



CONC DOWN : $(-\infty, -3)$

CONC UP $(-3, \infty)$

NOTE: WE HAVE A POI WHERE CONCAVITY CHANGES ASSUMING THAT POINT EXISTS IN OUR ORIG. FUNCTION

POI AT $X = -3$

④ PLUG THIS X-VALUE(S) BACK INTO ORIG FUNCTION AND FIND THE Y VALUE

$y = x^3 + 9x^2 + 6x - 12$

$y = (-3)^3 + 9(-3)^2 + 6(-3) - 12$

$y = -27 + 81 - 18 - 12$

$y = -57 + 81$

$y = 24$

POI : $(-3, 24)$