November 15, 2022

Finding Relative Extrema

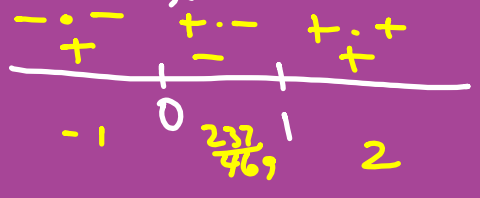
First Derivative Test

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

$f'(x) = 6x^2 - 6x = 0$

$\Rightarrow 6x(x-1) = 0$

$x = 0 \quad x = 1$



Rel max $(0, -4)$
Rel min $(1, -5)$

1) Find crit pts.
2) Test points
3) Do Mountain Test to determine max/min
4) State coordinates.

not a rel max or min

2ND DERIVATIVE TEST

$f(x) = x^3 + 3x^2 + 16$

$f'(x) = 3x^2 + 6x = 0$

$3x(x+2) = 0$

$x = 0 \quad x = -2$

$f''(x) = 6x + 6$

$f''(0) = 6(0) + 6 = 6 +$

$f''(-2) = 6(-2) + 6 = -$

1) Find critical pts
2) Test critical pts in f'' for U or ∩
3) Write coordinates.

Rel min at $(0, 16)$
Rel max at $(-2, 20)$

$f(-2) = -8 + 12 + 16 = 20$

Find rel. extrema.

$f(x) = \sqrt[3]{4-x^2} = (4-x^2)^{1/3}$

$f'(x) = \frac{1}{3}(4-x^2)^{-2/3} \cdot -2x$

$\frac{-2x}{3\sqrt[3]{(4-x^2)^2}} = 0$

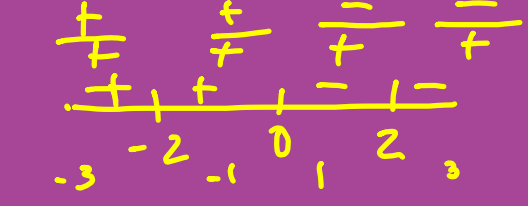
$-2x = 0$

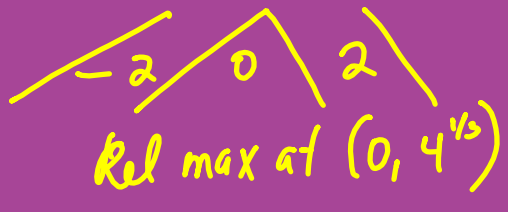
$x = 0$

$4 - x^2 = 0$

$\sqrt{4} = \sqrt{x^2}$

$\pm 2 = x$





Rel max at $(0, 4^{1/3})$