

First Derivative Test

Find the points of maxima & minima of

$$y = \frac{x}{1+x^2}$$

Soln:

$$y = \frac{u}{v} \quad (\text{Q Rule})$$

$$\frac{dy}{dx} = \frac{u'v - uv'}{v^2}$$

$$u = x \quad v = 1+x^2$$

$$u' = 1 \quad v' = 2x$$

$$\frac{dy}{dx} = \frac{1(1+x^2) - x(2x)}{(1+x^2)^2}$$

$$= \frac{1+x^2-2x^2}{(1+x^2)^2}$$

$$\frac{dy}{dx} = \frac{1-x^2}{(1+x^2)^2}$$

St points at

$$\frac{1-x^2}{(1+x^2)^2} = 0$$

$$\Rightarrow 1-x^2=0$$

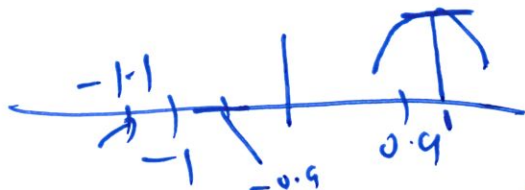
$$x^2=1$$

$$x = \pm 1$$

Examine $x = +1$.

$$x = 0.9 \text{ then } \frac{1-x^2}{(1+x^2)^2} = 1-0.$$

$$1 - (0.9)^2 > 0$$



$$x = 1.1 \quad 1 - 1.1^2 < 0 \Rightarrow \text{max}$$

At $x = -1$.

Try $x = -1.1$

$$1 - (-1.1)^2 < 0$$

$$x = -0.9 \quad 1 - (-0.9)^2 > 0$$

min

