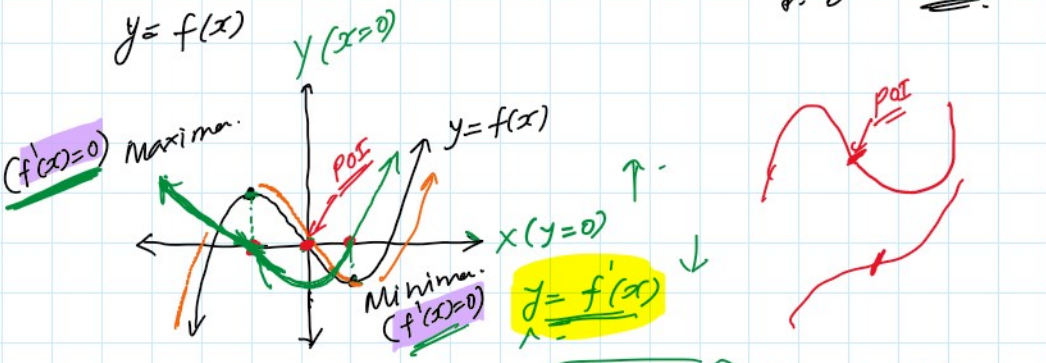
# Revision (Differentiation)

Thursday, May 13, 2021 6:03 AM

For test No typo / NO exy

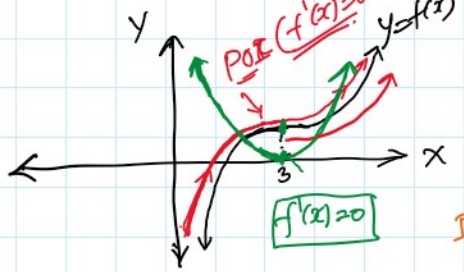
& basics Rules







(ii)



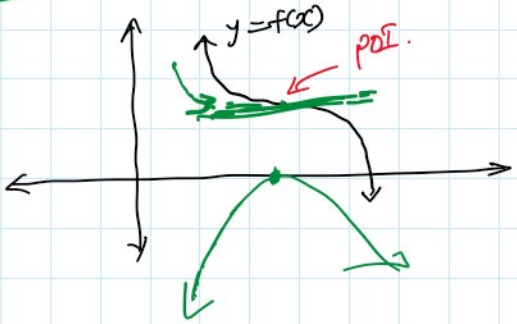

f'(x) > 0 increasing

f'(x) < 0 - decreasing

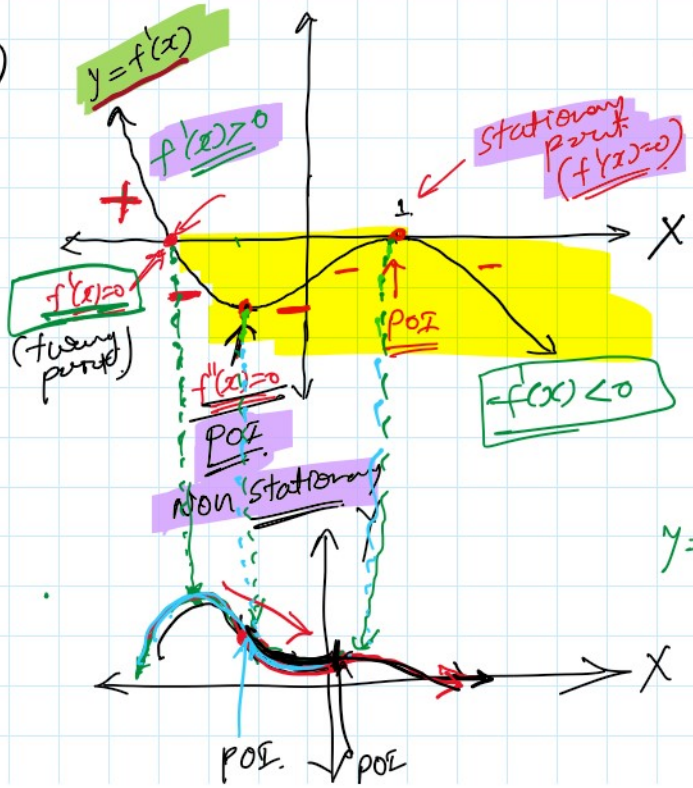
Do we have stationary point ?

y = f'(x) > 0 above x-axis

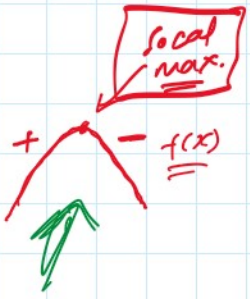
(iii)

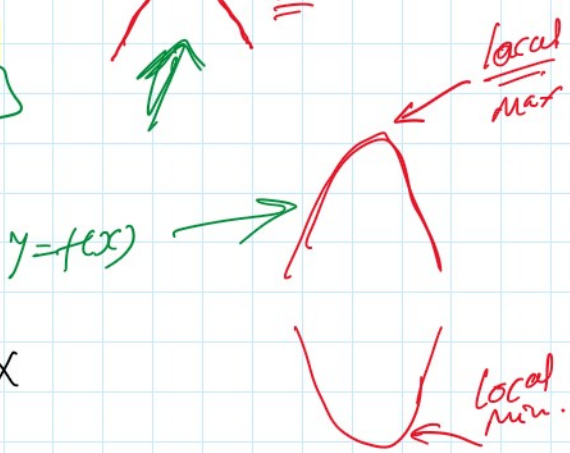



(iv)

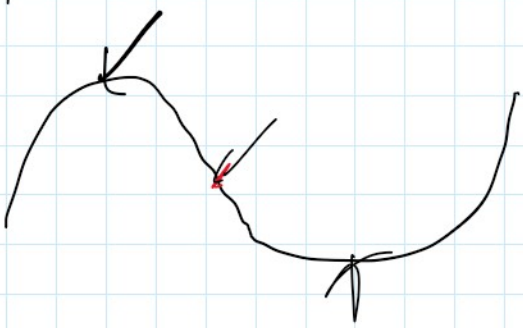


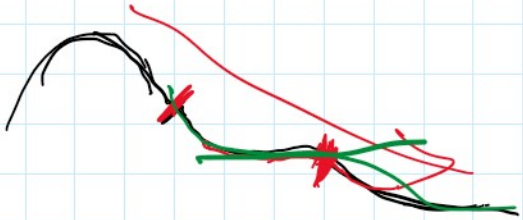

y = f(x)



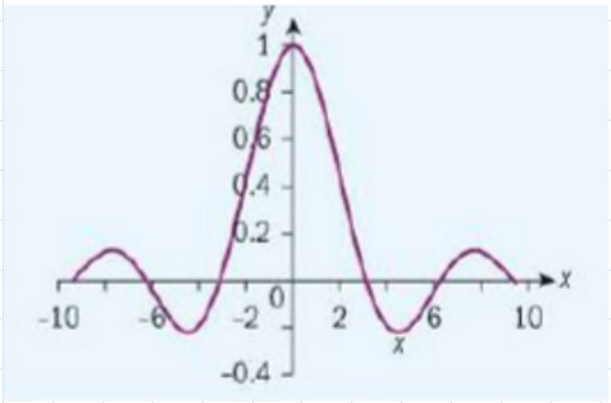



POI. POI



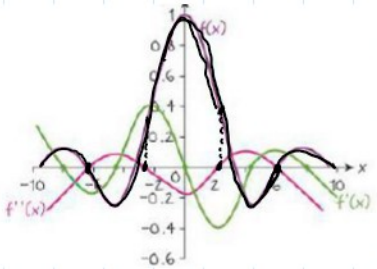


$y = f(x)$




$y = f'(x)$

& $y = f''(x)$




$f''(x) = 0$. POI

1

*[Maximum mark: 8]*

The points $A(0,1)$ and $B(b,0)$ lie on the curve $y^2e^x - xe^y = a$

(a) Find the values of $a$ and $b$. *[2 marks]*

(b) Find the equation of the tangent line to the curve at point $A$. *[4 marks]*

(c) Find the equation of the normal line to the curve at point $B$. *[2 marks]*

*[Maximum mark: 9]*

The line $y = 4x - 2$ is tangent to the curve $y = mx^3 + nx^2 - 1$, at the point where $x=1$.

(a) Find the values of $m$ and $n$. *[5 marks]*

(b) Find the normal line at the same point. *[2 marks]*

(c) Find the normal line at the point where $x = \frac{5}{3}$ *[2 marks]*

(a) $f'(x) = 3mx^2 + 2nx$

$f'(1) = 4 = 3m + 2n$

$2 = m + n - 1$

$m + n = 3$

$m = -2$

$n = 5$

(b) $y = -\frac{1}{4}x + \frac{9}{4}$ ✓

(c) $\frac{dy}{dx} = -6x^2 + 10x$

$y = x$

$\frac{dy}{dx}\left(x = \frac{5}{3}\right) = 0$

$m_N = \frac{-1}{0} = \infty$

$m_N = \infty$

line is Vertical.

$x = a$

$x = 5/3$

$5/3$

$m$ tangio $= \infty$

**4.** *[Maximum mark: 5]*

Find the two points of the curve of $f(x) = \frac{x-1}{x-2}$ which are closest to the point A(2,1).

Distance formula: $(x_1, y_1)$, $(x_2, y_2)$

$D = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

(2, 1)

$\left(x, y = \frac{x-1}{x-2}\right)$

$\left(x, \boxed{y = \frac{x-1}{x-2}}\right)$

$(2, 1)$

$D = \sqrt{(x-2)^2 + \left(\frac{x-1}{x-2} - 1\right)^2}$ ⟵

minimum.

$D^2 = (x-2)^2 + \left(\frac{x-1}{x-2} - 1\right)^2$ ⟵

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

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

Diff:

$f'(x) = 0$

GC Graph

local minimum.

$x = 1$ , $x = 3$.

$y = \frac{x-1}{x-2}$ ,

$y = 0$ , $y = 2$

$(1, 0)$ $(3, 2)$