

Q.4

1

Page No.

Date

$$\frac{(x-5)(x-6)}{(x-7)}(x^{1/2}) + \ln(8x) = f(x)$$

We will make three parts -

$$\underbrace{\left[\frac{(x-5)(x-6)}{(x-7)} \right]}_{\text{I}} \underbrace{\left[x^{1/2} \right]}_{\text{II}} + \underbrace{\left[\ln(8x) \right]}_{\text{III}}$$

$$I = \frac{[(x_1, 1) - (x_0, 0)][(x_1, 1) - (x_0, 0)]}{[(x_1, 1) - (x_0, 0)]}$$

$$= \frac{[(x-5, 1)(x-6, 1)]}{(x-7, 1)}$$

$$= \frac{[(x-5)(x-6), (x-6) + (x-5)]}{[(x-7), 1]}$$

$$= \frac{(\{x-5\}\{x-6\}, 2x-11)}{(\{x-7\}, 1)}$$

$$= \left(\frac{\{x-5\}\{x-6\}}{\{x-7\}}, \frac{\{2x-11\}\{x-7\} - \{x-6\}\{2x-5\}}{\{x-7\}^2} \right)$$

$$II = \left(x^{1/2}, \frac{1}{2}x^{-1/2} \right) \quad | \quad III = \left(\ln(8x), \frac{1}{x} \right)$$

$$(I)(II) = \left(\frac{[\{3x+1\}\{x-7\} - \{x-6\}\{x-5\}]x^{1/2} + \{1x^{1/2}\}\{x-5\}\{x-6\}}{\{x-7\}^2}, \right. \\ \left. \frac{\{x-8\}\{x-6\}\{x^{1/2}\}}{\{x-7\}} \right)$$

ordering should be reversed -

$(\overbrace{a, b})$

here.

If we add all the terms —

$$\begin{aligned}
 & \left(\frac{(x-5)\{x-6\}(x-7)}{\{x-7\}} + \ln(8x) \right), \\
 & \left(\frac{(x-4)\{x-5\}\{x-6\}x^{1/2}}{\{x-7\}^2} - \frac{(x-6)\{x-7\}x^{1/2}}{\{x-7\}^2} + \frac{\frac{1}{2}x^{1/2}}{\{x-7\}} \{x-5\}\{x-6\} + \frac{1}{x} \right) \\
 & = (f(x), f'(x))
 \end{aligned}$$

$$\begin{aligned}
 & [(x-5)(x-6) + (x-5)(x-6)(x-7)] x^{1/2} \\
 & \cdot (1 + \frac{1}{2}x^{-1/2}(x-5)(x-6)) \\
 & \cdot \left(\frac{(x-6)(x-7) - (x-5)(x-6)}{(x-7)^2} \cdot \frac{1}{x} + \frac{1}{x} \right) \\
 & \left(\frac{1}{x}(x-5) + 1 \right) x^{1/2} + \left(\frac{1}{x}(x-6) + 1 \right) x^{1/2} = T.
 \end{aligned}$$

Replacing x by 1 in the above equation we get

(8.4) 2

Page No.	
Date	

Put $x=4$

$$f(x) = \frac{(4-5)(4-6)\sqrt{4}}{(4-7)} + \ln(4x8),$$

$$= \frac{(-1)(-2)2}{-3} + \ln(32).$$

$$= -\frac{4}{3} + 3.46 = \underline{\underline{2.13}}$$

This not cut

$$f'(x) = \frac{(8-11)f(4-7) - f(4-6)f(4-5)\sqrt{4}}{(4-7)^2} + \frac{1}{2\sqrt{4}} \frac{f(4-5)f(4-8) + \frac{1}{4}}{(4-7)^2}$$

$$f'(x) = \left(\frac{9-2}{8}\right)2 + \frac{1}{4}\left(\frac{1}{3}\right).$$

$$= -\frac{14}{8} + \frac{1}{12} = \underline{\underline{1.639}}$$

Q5

1

Page No.

Date

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

$$\text{Put } x=0 \quad | \quad f(0) = \frac{1-1}{0} = \frac{0}{0} \text{ (Indefinite).}$$

L'Hopital Rule

$$\frac{1 + \sin x}{2x} \quad | \text{ at } x=0 \quad | \quad \frac{1+0}{0} = \frac{1}{0} \text{ form}$$

L'Hopital Rule

$$\frac{\cos x}{2} \quad | \text{ at } x=0 \quad | \quad f(0) = \frac{1}{2}$$

(85)

(3)

(3)

We use identity -

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

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

$$= \frac{2 \sin^2 \left(\frac{x}{2} \right)}{x^2}$$

$$= 0.5 \frac{\sin^2 \left(\frac{x}{2} \right)}{\left(\frac{x}{2} \right)^2}$$

No, cancellation in numerator.

(Q5)

(7)

$$g(n) = 0.5 \frac{\sin^2(x/2)}{(x/2)}.$$

$$= 0.5 \left(\frac{\sin(x/2)}{(x/2)} \right)^2$$

$$\lim_{x \rightarrow 0} g(n) = 0.5 \left[\lim_{x \rightarrow 0} \frac{\sin(x/2)}{(x/2)} \right]^2$$

$$= 0.5 [1]^2$$

So we get,

$$g(0) = 0.5$$