25/08/2020 (P.1) HILAL AHMAD

ID : 13144

QNO 1(a)

$$I = \int (\underset{\mathrm{I}}{x^2}\ \underset{\mathrm{II}}{e^x})\,dx$$

using by Parts.

$$I = x^2 \int e^x dx - \int \left(\int e^x dx \frac{d}{dx} x^2 \right) dx.$$

$$I = x^2 e^x - \int e^x (2x)\, dx$$

$$I = x^2 e^x - \int \underset{\mathrm{II}}{e^x}\ \underset{\mathrm{I}}{(2x)}\, dx.$$

Now using again by Parts

$$I = x^2 e^x - \left(2x \int e^x dx - \int \left(\int e^x dx \frac{d}{dx} 2x \right) dx\right.$$

$$I = x^2 e^x - \left(2x\, e^x - \int e^x (2)\, dx.\right.$$

again by Parts

$$I = x^2 e^x - \left(2x\, e^x - \left(2 \int e^x dx - \int \left(\int e^x dx \frac{d}{dx}\,(\text{Vdx})\right)\right.\right.$$

$$I = x^2 e^x - (2x\, e^x - 2e^x - \int e^x \times (0)\, dx$$

$$I = x^2 e^x - 2x e^x + 2 e^x - 0 + c$$

$$\boxed{I = x^2 e^x - 2 e^x + c}$$

25/08/2020 (P.2) HILAL AHMAD

ID : 13144

Q1 (b)

$$\int (1+3t)\cdot t^3 \, dt$$

using by parts formula

$$I = t^3 \int x(1+3t)\,dx - \int \left(\int (1+3t)\,dx \frac{d}{dx} + 3 \right) dx$$

$$= \int (1+3t)\,dx$$

suppose $= t = 1+3t$

$$= \int (t)\,dx$$

$$= \frac{t^{1+1}}{1+1} + c$$

$$= \frac{t^2}{2} + c$$

Put the value of $\boxed{t \frac{(1+3t)^2}{2} + c}$

$$I = t^3 \frac{(1+3t)^2}{2} - \int \frac{(1+3t)^2}{2} (3t^2)\,dx.$$

$$I = t^3 \frac{(1+3t)^2}{2} - \frac{3}{2} \left((1+3t)^2 (t^2)\,dx \right)$$

again by Parts

$$I = t^3 \frac{(1+3t)^2}{2} - \frac{3}{2} \left(t^2 \int (1+3t)\,dx - \int \left(\int (1+3t)\,dx \frac{d}{dx} \right.\right.$$

dx

HILAL AHMAD
ID : 13144

$$I = t^3 \frac{(1+3t)^2}{2} - \frac{3}{2}\left(t^2 \frac{(1+3t)^2}{2} - \int \frac{(1+3t^2)}{2}(x1) \right) dx$$

again by Parts

$$I = t^3 \left(\frac{1+3t}{2}\right)^2 - \frac{3}{2}\left(t^2 \frac{(1+3t)^2}{2} - t \int (1+3t)^2 \, dx - \int (1+3t)^2 dx . \frac{d}{dx} \right) dx$$

$$I = t^3 \left(\frac{1+3t}{2}\right)^2 - \frac{3}{2}\left(\frac{t^2(1+3t)^2}{2} - t \frac{(1+3t)^3}{3} - \int \frac{(1+3t)^3}{3}(1)\, dx \right)$$

$$I = t^3 \left(\frac{1+3t}{2}\right)^2 - \frac{3}{t_2}\left(t^2 \frac{(1+3t)^2}{2} - t \frac{(1+3t)^3}{3} - \left(\frac{(1+3t)^4}{4}\right.\right.$$

$$I = t^3 \frac{(1+3t)^2}{2} - t^2 \frac{(1+3t)^2}{4} + t \frac{(1+3t)^3}{6}$$

$$+ \frac{(1+3t)^4}{8} + C$$

Ans

Q1 (c) $\int (e^x - e^3)\,dx$:

using sum rule.

$$\int (e^x - e^3)\,dx = \int e^x dx - \int e^3 dx.$$

$$= \frac{e^{x+1}}{x+1} - \frac{e^{3+1}}{3+1} + c$$

$$= \frac{e^{x+1}}{x+1} - \frac{e^4}{4} + c$$

$$\boxed{= \frac{e^{x+1}}{x+1} - \frac{e^4}{4} + 6}$$ Ans

HILAL : 13144

(Q : 2)

$$f(x) = e^{-6x} \quad \& \quad x = -4$$

Sol :- $f(x) = e^{-6x}$

$= -4$

$\Rightarrow f(-4) = e^{-6(-4)}$

$f(-4) = (2.7183)^{24}$

$$\boxed{f(-4) = (2.649337.233 \times 10^{10}}$$

Now

$f'(x) = -6x \cdot e^{-6x-1} \frac{d}{dx}(-6x)$

$f'(x) = 6x\, e^{-6x-1} \; (-6)$

$f'(x) = 6(-4)\, e^{-6(-4)-1}$ (-6)

$f'(x) = 24 e^{-25} \; (-6)$

$f'(x) = +144 e^{-25} \Rightarrow 144(2.7183)^{-25}$

$f'(x) = 144 \times 7.201693401 \times 10^{10}$

$$\boxed{f'(x) = 1.037043855 \times 10^{13}}$$

Q:2 HILAL: 13144

Now using Taylor's series as:

$$F(x) = f(a) + \frac{(x-a)\,(f'(a)}{1!} + \frac{6(-a)^2 f''(a)}{2!} + \cdots$$

for $\boxed{a = -4}$

$$F(x) = f(-4) + (x+4))\, f'(-4) + \frac{(x+4)^2 f'(-4)}{2\times 1} + \cdots$$

$$e^{-6x} = 2.649337233 \times 10^{10} + \frac{(x+4)\ 1.037043855 \times 10^{15}}{2} + \cdots$$

$$e^{-6x} = 2.649337233 \times 10^{10} + (x+4)\,\frac{(1.037043855 \times 10^{15}}{2} + \cdots$$

HILAL: 13144

Q NO: 03 (a) find The derivative of The follo

(a) $f(y) = x.\sin x$

diff with respect to x

$$\frac{dy}{dx} = \frac{d}{dx}(x \sin x)$$

Applying Product rule.

$$y' = x\frac{d}{dx}(\sin x) + \sin x \frac{d}{dx}(x)$$

$$y' = x\cos x + \sin x (1)$$

$$\boxed{y' = x\cos x + \sin x}$$ Answer

Q: 3 (b)

(P. 8)

$$F(y) = x^2 \cos x$$

D. W. x

$$F'(y) = \frac{d}{dx}(x^2 \cos x)$$

Applying product rules.

$$F'(y) = x^2 \frac{d}{dx}(\cos x) + \cos x \frac{d}{dx} x^2$$

$$= (x^2 - \sin x) + \cos x + 2x$$

$$\boxed{F'(y) = -\sin x . x^2 + 2x \cos x}$$

Ans

Q 3 (C)

$$F(z) = Z \cdot (2Z-2)^2$$

$$F(Z = Z \cdot ((2Z)^2 + (2)^2 - ((2)(2)(2Z))$$

$$= Z \cdot (4z^2 + 4 - 8Z)$$

$$\frac{dz}{dZ} = \frac{d}{dZ}(4Z^3 + 4Z - 8Z^2)$$

= Applying some rules.

$$\frac{d}{dx}(4Z^3) + \frac{d}{dz} 4Z - \frac{d}{dZ} 8Z^2$$

$$4 \frac{d}{dZ} Z^3 + 4 \frac{d}{dZ} Z \quad 8 \frac{d}{dZ} Z^2$$

$$= (4 \times 3) Z^2 + 4(1) - 8(2) Z^{2-1}$$

$$= \boxed{12Z^2 + 4 - 16Z}$$

Ans