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Maths 2

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Q1

A

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

Sol

$$\int x^2 e^x dx = e^x(x^2 - 2x + 2) + c$$

We do it using integration by parts

Let $u = x^2$ and $v = e^x$ then $du = 2x\,dx$

and $dv = e^x\,dx$

Now integration by parts states that

$$\int u(x)\, v'(x)\, dx = u(x)\, v(x) - \int v(x)\, u'(x)\, dx$$

Hence

$$\int x^2 e^x dx = x^2 e^x - \int e^x \times 2x\, dx$$

$$= x^2 e^x - 2\int e x^x dx + c \ldots\ldots \rightarrow (1)$$

Q1

A

Now we set $u = x$ then $du = dx$

and $\int x e^{x} dx = x e^{x} - \int e^{x} \times 1 \times dx$ or

$\int x e^{x} dx = x e^{x} - \int e^{x} dx = x e^{x} - e^{x}$

Puting this in eq (1) we get

$\int x^2 e^{x} dx = x^2 e^{x} - 2(x e^{x} - e^{x}) + c$

$$\boxed{= e^{x}(x^2 - 2x + 2) + C}$$

Ans

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Q1

c

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

Sol

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

$$\int e^x\, dx - \int e^3\, dx$$

$$\boxed{e^x - e^3 x + c}$$

Ans

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Q1

B

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

Sol

Let

$u = 1+3t$

$v' = t^3$

$$\int \cancel{t}\; u \cdot v'\, dx$$

$$\int u\, dx = uv - \int v\, du$$

$$= \frac{1}{4}t^4 (1+3t) - \int \frac{3t^4}{4}\, dt$$

$$\boxed{= \frac{1}{4}t^4 (1+3t) - \frac{3t^5}{20} + c}$$

Ans

Q2

Find the Taylor series for ~~f~~ $f(x) = e^{-6x}$ about $x = 4$

sol

As we know that from Taylor series

i-e

$$f(x) = f(a) + (x+a) f'(a) + \frac{(x+a)^2}{2!} f''(a) + \frac{(x+a)^3}{3!} f'''(a) \cdots + \frac{(x-a)^n}{n!} f^n(a) \rightarrow ①$$

we will expend upto 3 terms them the taylor series becomes.

$$f(x) = f(a) + (x+a) f'(a) + \frac{(x-a)^2}{2!} f''(a) + \frac{(x-a)^3}{3!} f'''(a) \ldots \rightarrow ①$$

1st we will find derivative ea our required function upto three terms.

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Q2

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

(2) $f''(x) = 36e^{-6x}$

(3) $f'''(x) = -216e^{-6x}$

If $a = x = -4$ then

$f(-4) = e^{24} = 26.489 \times 10^9$

$f'(-4) = -6e^{24} = -158.9 \times 10^9$

$f''(-4) = 36e^{24} = 953.6 \times 10^9$

$f'''(-4) = -216e^{24} = -5721.6 \times 10^9$

from eq number (1)

$$f(x) = f(-4) + (x+4) f'(-4) + \frac{(x+4)^2}{2!} f''(-4) + \frac{(x+4)^3}{3!} f'''(-4) + \cdots\cdots$$

we get

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Q2

$$e^{-6x} = 26.489\times10^9 + (x+4)(-158.9\times10^9) + \frac{(x+4)^2}{2!}(953.6\times10^9) + \frac{(x+4)^3}{3!}(-5721.6\times10^9)$$

$$e^{-6x} = \left\{ 26.489 - (x+4)(158.9) + \frac{(x+4)^2}{2!}(953.6) - \frac{(x+4)^3}{3!}(-5721.6) \right\} 10^9$$

Ans

Q3

B

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

use product rule

$\cancel{dx}$ $\frac{d}{dx} x^2 \cdot \cos x + x^2 - \frac{d}{dx} \cos x$

$2x \cdot \cos x + x^2 - \sin x$

$\boxed{2x \cos x - x^2 \sin x}$

Ans

$$= \sin x + x \cos x$$

Ans

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Q3

(c)

$f(t) = z \cdot (2z-2)^2$

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

$= z \left[(2z)^2 + (2)^2 (z2)(2) \right]$

$= z \{ 4z^2 + 4 - 8z \}$

$4z^3 + 4z - 8z^2$

By using power role

$4z^3 + 4z - 8z^2$

$\Rightarrow 3 \cdot 4z^2 + 4 - (2 \cdot 8z^1)$

$\Rightarrow 14z^2 + 4 - 16z$

$\boxed{\Rightarrow 12z^2 - 16z + 4}$ Ans