

06/01/21
12:00

Arturo's Vitrus
190,37,92

[Pg. 1]
ACHA4000

Question (3)

a) i) $\int (x^5 - 2x)(5x^3 + 6x) dx$

~~$\int 5x^8 + 6x^6 - 10x^4 - 12x^2 dx$~~

$= \int 5x^8 + 6x^6 - 10x^4 - 12x^2 dx$

$= \int 5x^8 dx + \int 6x^6 dx - \int 10x^4 dx - \int 12x^2 dx$

$= \frac{5x^9}{9} + \frac{6x^7}{7} - 2x^5 - 4x^3$

$= \frac{5x^9}{9} + \frac{6x^7}{7} - 2x^5 - 4x^3 + C$

ii) $(e^{5x} + 1)(e^{3x} + 2) dx$

$= dx(e^{8x} + 2e^{5x} + e^{3x} + 2)$

$= e^{8x} dx + 2e^{5x} dx + e^{3x} dx + 2dx$

iii) ~~$\int_0^2 (3x^3 + 2x)^3 + 4x + 3 dx$~~

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Question Three

a) iii) $\int_0^2 (3x^3 + 2x)^3 + 4x + 3 \, dx$

$$= \int_0^2 \left(\frac{9x^6 - 4x^2}{3x^3 - 2x} \right)^3 + 4x + 3 \, dx$$

$$= \int_0^{\sqrt{\frac{2}{3}}} \left(\frac{9x^6 - 4x^2}{3x^3 - 2x} \right)^3 + 4x + 3 \, dx = \sqrt{6} + \frac{256}{45}$$

$$= \sqrt{6} + \frac{256}{45} - \sqrt{6} + \frac{44254}{9}$$

$$= \frac{24614}{5} = 4922.8$$

iv) $\int_2^4 (2x+3)(x+5) \, dx$

$$= \int_2^4 (2x^2 + 13x + 15) \, dx$$

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Question Three

b) ~~$\int 4x \cos(3x) dx$~~

$$\int 4x \cos 3x dx$$

$$= 4x \int x \cos(3x) dx$$

$$= 4 \cdot \int \frac{u \cos(u)}{9} du$$

$$= 4 \cdot \frac{1}{9} \cdot \int u \cos(u) du$$

$$= 4 \cdot \frac{1}{9} (u \sin(u) - (-\cos(u)))$$

~~$= \frac{4}{9} (3x \sin(3x) + \cos(3x))$~~

$$= \frac{4}{9} (3x \sin(3x) + \cos(3x))$$

$$= \frac{4}{9} (3x \sin(3x) + \cos(3x)) + C$$

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Question Three

$$b) ii) \int_1^2 3x e^{2x} dx$$

$$= 3 \cdot \int_1^2 x e^{2x} dx$$

$$= 3 \cdot \int_2^4 \frac{e^u}{4} du$$

$$= 3 \cdot \frac{1}{4} \cdot \int_2^4 e^u du$$

$$= 3 \cdot \frac{1}{4} \left[e^u - \int e^u du \right]_2^4$$

$$= 3 \cdot \frac{1}{4} \left[e^u - e^u \right]_2^4$$

$$= \frac{3}{4} \left[e^u - e^u \right]_2^4$$

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Question Three

$$c) i) \int \frac{21x^2 + 10x - 3}{7x^3 + 5x^2 - 3x - 1} dx$$

$$= \int \frac{1}{u} du$$

$$= \ln|7x^3 + 5x^2 - 3x - 1| + C$$

$$ii) \int \frac{8}{3x + 10} dx$$

$$= 8 \cdot \int \frac{1}{3x + 10} dx$$

$$= 8 \cdot \int \frac{1}{3u} du$$

$$= 8 \cdot \frac{1}{3} \cdot \int \frac{1}{u} du$$

$$= 8 \cdot \frac{1}{3} \ln|u|$$

$$= \frac{8}{3} \ln|3x + 10| + C$$

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Question Three

$$c) \text{ iii) } \int \frac{1}{x^2+9} dx$$

$$= \int \frac{1}{3(u^2+1)} du$$

$$= \frac{1}{3} \cdot \int \frac{1}{u^2+1} du$$

$$= \frac{1}{3} \arctan(u)$$

$$= \boxed{\frac{1}{3} \arctan\left(\frac{x}{3}\right) + C}$$

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Question 1

$$a) i) \begin{pmatrix} 8 & -1 & 7 \\ -5 & 2 & 5 \\ 3 & 0 & 2 \end{pmatrix} \times \begin{pmatrix} -2 & 8 & 0.5 \\ 2 & 5 & 2 \\ 0 & -9 & 1 \end{pmatrix} = \begin{pmatrix} -18 & -4 & 9 \\ 14 & -75 & 6.5 \\ -6 & 6 & 3.5 \end{pmatrix}$$

$$ii) \begin{pmatrix} -2 & 8 & 0.5 \\ 2 & 5 & 2 \\ 0 & -9 & 1 \end{pmatrix} \times \begin{pmatrix} 8 & -1 & 7 \\ -5 & 2 & 5 \\ 3 & 0 & 2 \end{pmatrix} = \begin{pmatrix} 54.5 & 18 & 27 \\ -3 & 8 & 43 \\ 48 & -18 & -43 \end{pmatrix}$$

$$iii) \begin{pmatrix} 8 & -1 & 7 \\ -5 & 2 & 5 \\ 3 & 0 & 2 \end{pmatrix} \times \begin{pmatrix} 2 & 5 \\ -6 & 0 \\ 1 & 12 \end{pmatrix} = \begin{pmatrix} 29 & 124 \\ -17 & 35 \\ 8 & 39 \end{pmatrix}$$

iv) Impossible

v)

$$A = \begin{pmatrix} 8 & -1 & 7 \\ -5 & 2 & 5 \\ 3 & 0 & 2 \end{pmatrix} | A| = 8(2 \times 2 - 0 \times 5) - 1(-5 \times 2 - 5 \times 3) + 7(-5 \times 0 - 2 \times 3) \\ = 32 - 25 - 42 \\ = -35$$

$$vi) \begin{pmatrix} -2 & 8 & 0.5 \end{pmatrix}$$

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Question One

d) vii)
$$\begin{pmatrix} 8 & -1 & 7 \\ -5 & 2 & 5 \\ 3 & 0 & 2 \end{pmatrix} + \begin{pmatrix} -2 & 8 & 0.5 \\ 2 & 5 & 2 \\ 0 & -9 & 1 \end{pmatrix} = \begin{pmatrix} 6 & 7 & 7.5 \\ -3 & 7 & 7 \\ 3 & -9 & 3 \end{pmatrix}$$

viii)
$$\begin{pmatrix} 8 & -1 & 7 \\ -5 & 2 & 5 \\ 3 & 0 & 2 \end{pmatrix} \times \begin{pmatrix} -2 & 8 & 0.5 \\ 2 & 5 & 2 \\ 0 & -9 & 1 \end{pmatrix} = \begin{pmatrix} -18 & -4 & 9 \\ 14 & -75 & 6.5 \\ -6 & 6 & 3.5 \end{pmatrix}$$

$$\begin{pmatrix} -18 & -4 & 9 \\ 14 & -75 & 6.5 \\ -6 & 6 & 3.5 \end{pmatrix} + \begin{pmatrix} 8 & 14 \\ 0.25 & 21 \end{pmatrix} \neq \text{impossible}$$

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Question One

$$d) A = \begin{pmatrix} 2 & 3 & 2 \\ 1 & 2 & 5 \\ 3 & 1 & -2 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 14 \\ 4 \\ 19 \end{pmatrix} \quad |A| = 2(-9) - 3(-17) + 2(-5) = 23$$

$$A_1 = \begin{pmatrix} 14 & 3 & 2 \\ 4 & 2 & 5 \\ 19 & 1 & -2 \end{pmatrix} \quad |A_1| = 14(-9) - 3(-103) + 2(-34) = 115$$

$$A_2 = \begin{pmatrix} 2 & 14 & 2 \\ 1 & 4 & 5 \\ 3 & 19 & -2 \end{pmatrix} \quad |A_2| = 2(-103) - 14(-17) + 2 \times 7 = 46$$

$$A_3 = \begin{pmatrix} 2 & 3 & 14 \\ 1 & 2 & 4 \\ 3 & 1 & 19 \end{pmatrix} \quad |A_3| = 2 \times 34 - 3 \times 7 + 14(-5) = -23$$

$$x = \frac{|A_1|}{|A|} = 5$$

$$y = \frac{|A_2|}{|A|} = 2$$