

Date:- 28/04/2020

Time:- 11:00

Module Code:- Analytical methods and Study Skills M4X02193

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1.) a.) $y = 9x^4 - 2x^3 + 2x + 5$

$$\frac{dy}{dx} = 36x^3 - 6x^2 + 2$$

b.) $y = (x+2)(x+5) / y = x^2 + 7x + 10$

$$\frac{dy}{dx} = 2x + 7$$

c.) $y = 2e^{2x} + 2 \ln x$

$$\frac{dy}{dx} = (2) 2e^{2x} + (2) \frac{1}{x}$$

$$\frac{dy}{dx} = 4e^{2x} + \frac{2}{x}$$

d.) $y = 2 \sin 5x$

$$\frac{dy}{dx} = (2) 5 \cos 5x / \frac{dy}{dx} = 10 \cos 5x$$

e.) $y = \frac{1}{x^3} / y = x^{-3}$

$$\frac{dy}{dx} = -3x^{-4}$$

f.) $y = x^3 \sin x / \frac{du}{dx} = 3x^2 / \frac{dv}{dx} = \cos x$

$$\frac{dy}{dx} = (x^3)(\cos x) + (\sin x)(3x^2)$$

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$$g) y = \frac{x^5 + 2x + 1}{\sin x}$$

$$\frac{du}{dx} = 5x^4 + 2 \quad \bigg/ \quad \frac{dv}{dx} = \cos x$$

$$\frac{dy}{dx} = \frac{(\sin x)(5x^4 + 2) - (x^5 + 2x + 1)(\cos x)}{(\sin x)^2}$$

$$h) y = (6x^3 + 2x^2 - 1)^5$$

~~$$\frac{dy}{dx} = 5(6x^3 + 2x^2 - 1)^4(18x^2 + 2x)$$~~

$$\frac{dy}{dx} = 5(6x^3 + 2x^2 - 1)^4(18x^2 + 4x)$$

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2.) $z_1 = 6 + 2j$ / $z_2 = 2 - 5j$

i.) $8 - 3j$

ii.) $4 + 7j$

$j^2 = -1$

iii.) $12 - 30j + 4j - 10j^2$

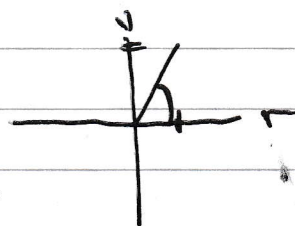
$12 - 26j - 10(-1)$

$12 - 26j + 10$

$22 - 26j$

b.) $(2 + 7j)^5$

$r = \sqrt{2^2 + 7^2}$ / ~~$\sqrt{2^2 + 7^2}$~~ $r = 7.28$



$\theta = \tan^{-1}\left(\frac{7}{2}\right) = 74.05^\circ$

$r^n (\cos n\theta + j \sin n\theta)$

$7.28^5 (\cos(5)(74.05) + j \sin(74.05)(5))$

$20448.29 (\cos 370.25 + j \sin 370.25)$

$20121.95 + 3638.64j$

c.) Cartesian form

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3.)

a) $\int 8x^3 + 5x + 7 \, dx$

$$= \frac{8x^4}{4} + \frac{5x^2}{2} + 7x + C$$

b) $\int \frac{1}{x^7} \, dx$ / $\int x^{-7} \, dx$

$$= \frac{x^{-6}}{-6} + C$$

c) $\int -\sin x \, dx$

$$= (-) - \cos x = \cos x + C$$

d) $\int (x+3)^2 \, dx$ / $\int (x+3)(x+3) \, dx$

$$\int x^2 + 6x + 9 \, dx$$

$$= \frac{x^3}{3} + \frac{6x^2}{2} + 9x + C$$

e) $\int_0^3 x^2 + 3x + 2 \, dx$

$$= \left[\frac{x^3}{3} + \frac{3x^2}{2} + 2x \right]_0^3$$

$$\frac{(2)^3}{3} + \frac{3(2)^2}{2} + 2(2) - 0$$

$$= 12.6$$

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$$f.) \int_2^3 (x+4)(x+1) \div \int_2^3 x^2 + 5x + 4$$

$$\int_2^3 \left[\frac{x^3}{3} + \frac{5x^2}{2} + 4x \right]_2^3$$

$$\left[\frac{(3)^3}{3} + \frac{5(3)^2}{2} + 4(3) \right] - \left[\frac{(2)^3}{3} + \frac{5(2)^2}{2} + 4(2) \right]$$

$$9 + 22.5 + 12$$

$$43.5$$

$$43.5$$

$$- 2.67 + 10 + 8$$

$$- 20.67$$

$$= 22.83$$

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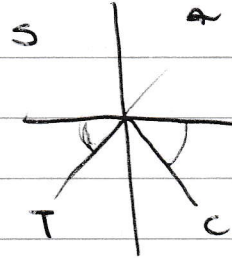
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4.)

a.) $\tan \alpha = 0.35$

$\alpha = 19.29 / \alpha = 199.29$



b.) $\sin \alpha = -0.68$

$\sin^{-1}(0.68) = 42.84$

$\alpha = 222.84 / \alpha = 317.16$