

Morgan Albrighton-
2107358

Further Mathematics

(ACHA 4006)

5/5/2022
Page 1.

(i) $y = 5x^4 + 5x^2 + 3x - 19$

$$\frac{dy}{dx} = 20x^3 + 10x + 3$$

(ii) $y = (2x+5)(x-1)$

~~$y = 2x^2$~~ $y = 2x^2 - 2x + 5x - 5$

~~$\frac{dy}{dx}$~~ $y = 2x^2 + 3x - 5$

$$\frac{dy}{dx} = 4x + 3$$

(iii) $y = \frac{1}{x^6} - \cos 5x$

~~$y = x^{-6} - \cos 5x$~~

~~$\frac{dy}{dx} = -5\sin$~~ $\frac{dy}{dx} = x^{-6} - 5\sin 5x$

(iv) $y = e^{2x} \sin 3x$

~~$\frac{dy}{dx}$~~ $\frac{du}{dx} = 2e^{2x}$

$\frac{dv}{dx} = 3\cos 3x$

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

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Further Mathematics
(ACHA 4000)

5/5/2022
Page 2.

$$(v) y = \frac{\tan 7x}{\sin x}$$

$$\frac{du}{dx} = 7 \sec^2 7x$$

$$\frac{dv}{dx} = \cos x$$

$$\frac{dy}{dx} = \frac{(\sin x)(7 \sec^2 7x) - (\tan 7x)(\cos x)}{(\sin x)^2}$$

$$(vi) y = \sqrt{6x^2 - 3x + 5}$$

$$y = (6x^2 - 3x + 5)^{0.5}$$

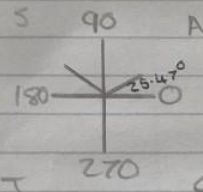
$$0.5(6x^2 - 3x + 5)^{-0.5}$$

$$\frac{dy}{dx} = 0.5(6x^2 - 3x + 5)^{-0.5} (12x - 3)$$

Q2 (i) $\sin x = 0.43$

$$\sin^{-1} = 25.47^\circ$$

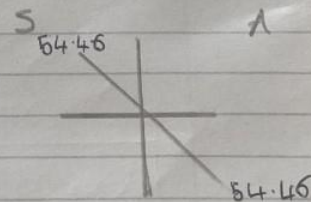
$$x = 25.47^\circ$$



$$x = 180 - 25.47^\circ = 154.53^\circ$$

(ii) $\tan x = -7$

$$\tan^{-1} \left(\frac{-7}{5} \right) = -54.46^\circ$$



$$x = 305.54^\circ$$

$$x = 125.54^\circ$$

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Further mathematics
(ACHA 4006)

5/5/2022
Page 3.

(iii) $5 \cos x = 3$.

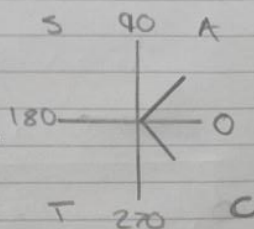
$$\cos^{-1}\left(\frac{3}{5}\right) = 53.13^\circ$$

~~270 - 53.13~~ $360 - 53.13 = 306.87$

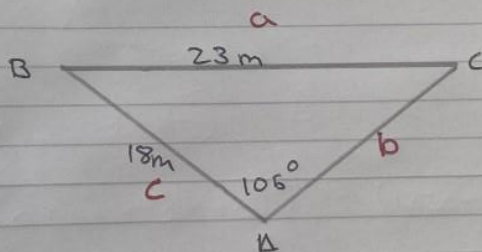
$$360 - 53.13 = 306.87$$

$x = 53.13^\circ$

$x = 306.87^\circ$



Q3)



(i) $\frac{23}{0.47} = \frac{b}{\sin 13} = \frac{18}{\sin C}$

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Further mathematics.
(Alma 4006)

5/5/2022.
Page 4.

Q4

$$(i) y = \frac{t(x^2 + R)}{t}$$

$$ty = t(x^2 + R)$$

$$x^2 = \frac{ty}{t} - R$$

$$x = \sqrt{\frac{ty}{t} - R}$$

$$Q6) \int x^8 + 4x^3 + 5x - 1 \, dx$$

$$(i) \frac{x^9}{9} + \frac{4x^4}{4} + \frac{5x^2}{2} - x + c$$

$$(ii) \int 5x^2(x^3 + 2x + 1) \, dx$$
$$\int \frac{5x^3}{3} \left(\frac{x^4}{4} + \frac{2x^2}{2} + x \right)$$

$$= \frac{5x^3}{3} \left(\frac{x^4}{4} + x^2 + x \right) + c$$

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Further mathematics
(Achev 4005)

5/5/2022

Page 5.

(iii) $\int 5 \sin 3x \, dx$ $5 \int \sin 3x \, dx$

$$\cancel{5x} = \frac{-1}{3} \cos 3x \quad \leftarrow -\frac{5}{3} \cos 3x + C.$$

(iv) $\int_0^5 (x+5)(x+1) \, dx$

$$\int_0^5 x^2 + 6x + 5 \, dx$$

$$\int_0^5 x^2 + 6x + 5 \, dx$$

$$\left[\frac{x^3}{3} + \frac{6x^2}{2} \right]_0^5$$

$$\left[\frac{(5)^3}{3} + \frac{6(5)^2}{2} \right]$$

$$\left[\frac{125}{3} + \frac{150}{1} \right]$$

$$\left[41.67 + 150 \right]$$

$$= 191.67.$$