

$$ii) \log(x+5) + \log(x+2) :$$

$$\log(x+7) + \log(x+6)$$

$$\log(x^2 + 2x + 5x + 10)$$

$$\log(x^2 + 6x + 7x + 42)$$

$$\log(x^2 + 7x + 10) = \log(x^2 + 13x + 42)$$

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

$$\left[ \left( \frac{x^2}{2} + 5x \right) \left( \frac{x^2}{2} + x \right) \right]_0^5$$

$$\left( \frac{5^2}{2} + 5(5) \right) \left( \frac{5^2}{2} + 5 \right) - \left( \frac{0^2}{2} + 5(0) \right)$$

$$\left( \frac{6^2}{2} + 0 \right)$$

$$\left( \frac{25}{2} + 25 \right) \left( \frac{25}{2} + 5 \right)$$

$$(57.5)(17.5) = 656.25 \text{ units}^2$$

$$\frac{2625}{4} \text{ units}^2$$

$$i) \frac{23}{\sin 105} = \frac{18}{\sin C}$$

$$23(\sin C) = 18(\sin 105)$$

$$\sin C = \frac{18(\sin 105)}{23}$$

$$\frac{18 \times 0.97}{23} = 0.76$$

$$C = \sin^{-1}(0.76)$$

$$C = 49.46^\circ$$

$$ii) B = 105 + 49.46 = 154.46^\circ$$

$$B = 180 - 154.46 = 25.54^\circ$$

$$iii) \frac{b}{\sin(25.54)} = \frac{23}{\sin(105)}$$

$$b = \frac{23 \sin 25.54}{\sin 105}$$

$$b = \frac{23(0.43)}{\sin 105}$$

$$b = \frac{9.92}{\sin 105}$$

$$b = 10.27 \text{ cm}$$

## Further Mathematics Exam

Module code: ACHA4006

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## Question one

$$i) y = 5x^4 + 5x^2 + 3x - 10$$

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

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

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

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

$$y = 2x^2 + 3x - 5$$

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

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

$$\text{iii) } y = \frac{1}{x^5} - \cos 3x$$

$$y = x^{-5} - \cos 3x$$

$$\frac{dy}{dx} = 6x^{-7} - - 3 \sin 3x$$

$$\frac{dy}{dx} = 6x^{-7} + 3 \sin 3x$$

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

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

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

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

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

$$180 + 54.46 = 234.46^\circ$$

$$180 - 54.46 = 125.54^\circ$$

$$x = 234.46^\circ \quad x = 125.54^\circ$$

$$(ii) \quad 5 \cos x = 3$$

$$\cos x = \frac{3}{5}$$

$$x = \cos^{-1}(0.6) \quad x = 53.13$$

$$x = 360 - 53.13 = 306.87^\circ$$

Question three

$$(ii) \quad B = \dots = 23m \dots$$



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{23}{\sin 105} = \frac{b}{\sin 125.50} = \frac{18}{\sin 49.46}$$

Question Six

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

$$\int (x^8 + 4x^3 + 5x - 1)$$

$$\int \frac{x^9}{9} + x^4 + \frac{5}{2} x^2 - x + C$$

$$ii) \int 3x^2 (x^3 + 2x + 1) \, dx$$

$$\frac{3x^3}{3} \left( \frac{x^4}{4} + \frac{2x^2}{2} + x \right) + C$$

$$\frac{3x^3}{3} \left( \frac{x^4}{4} + x^2 + x \right) + C$$

$$\frac{3}{3} x^3 \left( \frac{x^4}{4} + x^2 + x \right) + C$$

### Question Four

i) Make  $x$  the Subject

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

$$y\theta = t(x^2 + R)$$

$$\frac{y\theta}{t} = x^2 + R$$

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

$$\sqrt{\frac{y\theta}{t} - R} = x$$

vi)

Question two

i)  $\sin x = 0.43$

$$x = \sin^{-1}(0.43)$$

$$x = 25.47$$

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

$$x = 154.53^\circ$$

ii)  $\tan x = -7$

$$\tan x = \frac{-7}{1} \quad \tan x = -1.4$$

$$\tan^{-1}(-1.4)$$

$$x = \tan^{-1}(-1.4) \quad x = -54.46$$

### Question Five

$$i) \quad 3^{(x+4)} = 7^x$$

$$(x+4)\log 3 = x \log 7$$

$$(x+4)0.477 = 0.845x$$

$$0.477x + 1.908 = 0.845x$$

$$1.908 = 0.845x - 0.477x$$

$$1.908 = 0.368x$$

$$\frac{1.908}{0.368} = x$$

$$x = 5.185$$

$$\text{iii)} \int 3 \sin 3x \, dx$$

$$u = 3x$$

$$\int 3 \sin u \, dx$$

$$\frac{du}{dx} = 3$$

$$\frac{du}{3} = dx$$

$$\int 3 \sin u \, \frac{du}{3}$$

$$\int \frac{3}{3} \sin u \, du$$

$$\frac{3}{3} (\sin u \, du)$$

$$\frac{3}{3} - \cos 3x + C$$

$$= \frac{3}{3} \cos 3x + C$$