

Module Code: ACHA4006
Further Maths Exam Resist
20/07/22

Question One

Differentiate the following functions:

①

$$(i) y = 6x^3 + 2x^2 + 7x - 10$$

~~$$\frac{dy}{dx} = 18x^2 + 4x + 17$$~~

$$\frac{dy}{dx} = 18x^2 + 4x + 7$$

$$(ii) y = (x+7)(x-2)$$

$$y = x^2 + 5x - 14$$

$$\frac{dy}{dx} = 2x + 5$$

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~~(iii) $y = \frac{1}{x^{10}}$~~

(iii) $y = \frac{1}{x^9} - \sin 3x$

$$\frac{dy}{dx} = -9x^{-10} - 3 \cos 3x$$

(iv) $y = e^{7x} \sin 5x$

$$\frac{dy}{dx} = e^{7x} \frac{d}{dx} (\sin 5x) + 7e^{7x} \sin 5x$$

$$\frac{dy}{dx} = 5e^{7x} \cos 5x + 7e^{7x} \sin 5x$$

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$$(v) y = \frac{x^2}{\cos x}$$

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

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

$$(vi) y = \sqrt{8x^4 + x + 7}$$

$$\frac{dy}{dx} = \frac{32x^3 + 1}{\sqrt{8x^4 + x + 7}}$$

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Question Two

Solve the following trigonometric equations for $0^\circ \leq x \leq 360^\circ$:

(i) $\sin x = 0.87$

$$x = \sin^{-1}(0.87)$$

$$x = 60.45^\circ$$

(ii) $4 + \tan x = -9$

$$\tan x = -\frac{9}{4}$$

$$x = \tan^{-1}(-2.25)$$

$$x = -66.03^\circ$$

(iii) $7 \cos x = 2$

$$\cos x = \frac{2}{7}$$

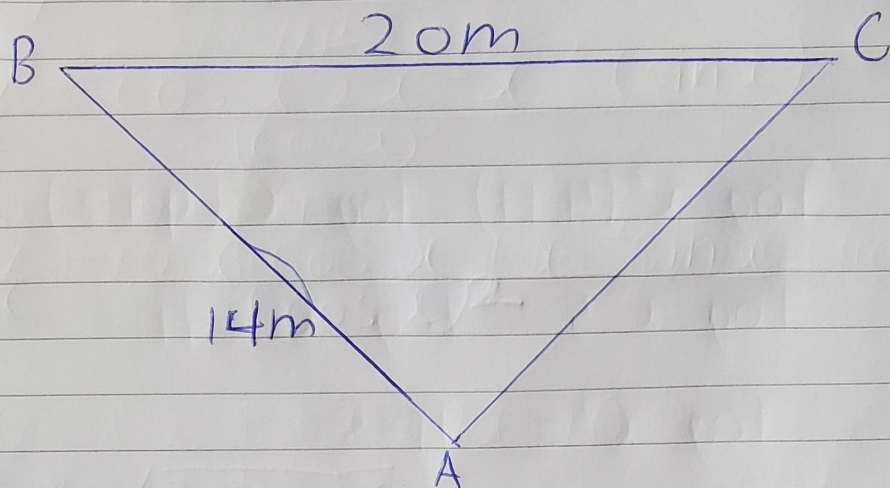
$$x = \cos^{-1}(0.28)$$

$$x = \cos^{-1}(0.2)$$

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Question Three



If the angle at A is 102° , find (i) Angle C, (ii) Angle B and (iii) length AC.

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$(20)^2 = (14)^2 + c^2 - 2 \times (14) \times c \cos 102^\circ$$

$$400 - 196 = c^2 + 5.821$$

$$c^2 = 204 - 5.821$$

$$c = 14$$

$$AC = 14m$$

$$\angle B = \angle C$$

$$2x = 78$$

$$x = 39^\circ$$

$$\angle B = \angle C = 39^\circ$$

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Question 4

Transpose the following formula to get
P as the subject

$$U = \frac{r(p^3 - T)}{Z}$$

(4mks)

$$U = r \left(\frac{p^3 - T}{Z} \right)$$

$$UZ = rp^3 - rT$$

$$p^3 = \frac{UZ + rT}{r}$$

$$p = \left(\frac{UZ + rT}{r} \right)^{\frac{1}{3}}$$

Question Five

Solve the following equations for x

(i) $2^{x+3} = 4x$

$$2^{x+3} = 2^{2x}$$

$$x+3 = 2x$$

$$3 = 2x - x$$

$$3 = x$$

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$$(ii) \rightarrow \frac{\log(x+4) + \log(x+1)}{\log(x+2)} = \log(x+9) + \quad (10 \text{ mks})$$

$$\log x^2(4+1) = \log x^2(9+2)$$

$$\log x^2 5 = \log x^2 11$$

$$\log x^2 = 11 - 5$$

$$\log x^2 = 6$$

$$\log x = 3$$

Question Six

Integrate the following:

(18 mks)

$$(i) \int x^5 + 3x^2 - 4x - 5 \, dx$$

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

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$$(ii) \int x^5 (x^2 + x + 7) dx$$

$$= \int (x^7 + x^6 + 7x^5) dx$$

$$= \frac{x^8}{8} + \frac{x^7}{7} + \frac{7x^6}{6} + C$$

$$(iii) \int 7 \cos 2x dx$$

$$= \frac{7 \sin 2x}{2} + C$$

$$(iv) \int_0^2 (x+3)(x+2) dx$$

~~is~~

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

$$= \frac{8}{3} + \frac{20}{2} + 12$$

$$= \frac{8}{3} + 10 + 12 = \frac{8+30+36}{3} = \frac{74}{3}$$

$$\boxed{\text{ans} = \frac{74}{3}}$$