

2004 Higher Maths Paper 2

Unofficial Answers

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1. a. $a = 26.6^\circ$
b. $m = 1.5$

2. a. $\vec{QP} = \begin{pmatrix} -1 \\ 3 \\ -2 \end{pmatrix}, \vec{QR} = \begin{pmatrix} -5 \\ 1 \\ 1 \end{pmatrix}$
b. $\angle PQR = 72^\circ$

3. $b^2 - 4ac = p^2 + 24$
 $p^2 + 24 \geq 0$

So roots are always real

4. a. For a limit to exist $-1 < k < 1$
b. $k = \frac{2}{5}$

5. a. $x = 2$
b. $y = 12x - 8$

6. a. $\sqrt{34} \cos(x - 59)^\circ$
b. $x = 12.3^\circ$

7. Draw a parabola with a maximum turning point
Cuts the x-axis at 1 and 3
No need to work out turning point

8. a. Find coordinates of A, use gradient formula to find $m_{AP} = 2$

$$\text{Work out } m_{\text{tangent}} = -\frac{1}{2}$$

Use $y - b = m(x - a)$ find the equation of the line

- b. Rearrange equation of tangent to $x = 3 - 2y$

Substitute this equation into the equation of the circle

Factorise to get one solution or use $b^2 - 4ac = 0$

- c. Use distance formula

$$\text{Length of PQ} = 4\sqrt{5}$$

$$SA = 12\text{units}^2$$

$$SA = (2x^2) + 2(xh) + 2(2xh)$$

$$SA = 6xh + 2x^2$$

$$6xh = 12 - 2x^2$$

$$h = \frac{12 - 2x^2}{6x}$$

9. a. $V = Ah$

$$V = (2x^2)h$$

$$V = 2x^2 \times \frac{12 - 2x^2}{6x}$$

$$V = \frac{24x^2 - 4x^4}{6x}$$

$$V = \frac{2}{3}x(6 - x^2)$$

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

$$\text{let } \frac{dy}{dx} = 0$$

- b. $4 - 2x^2 = 0$

$$2x^2 = 4$$

$$x^2 = 2$$

$$x = \pm\sqrt{2}$$

Maximum when $x = \sqrt{2}$ (Use a nature table to prove this)

10. a. 4433 Micrograms
b. 346.57 years

11. Area = $\frac{2}{3}m^2$

[END OF ANSWERS TO 2004 HIGHER MATHS PAPER 2]

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