

MATHEMATICAL METHODS (CAS)

Unit 1 – Written examination 1



2008 Trial Examination

SOLUTIONS

Question 1

$$(x+2)^2 - 9 = 3x + 1$$

$$x^2 + 4x + 4 - 9 = 3x + 1$$

$$x^2 + 4x - 5 = 3x + 1$$

$$x^2 + x - 6 = 0$$

$$(x-2)(x+3) = 0$$

$$x = 2, -3$$

$$\text{sub. values in } y = 3x + 1$$

$$y = 3(2) + 1 \text{ ... and ... } y = 3(-3) + 1$$

$$y = 7 \text{ } y = -8$$

$$\text{co-ords. } (2, 7), \text{ and } (-3, -8)$$

M3 + A1

Question 2

$$1) \dots 4 = 1 + a + b + 6 \text{ ... and ... } 2) \dots 0 = -1 + a - b + 6$$

$$\text{eqn. 1.} + \text{eqn. 2}$$

$$-8 = 2a$$

$$a = -4, \text{ sub. in. 1)}$$

$$-3 = -4 + b$$

$$b = 1$$

$$\therefore a = -4, b = 1$$

M2 + A1

Question 3

a. $(3x)^3 - (2y)^3$
 $(3x - 2y)(9x^2 + 6xy + 4y^2)$

A1

$$P(-1) = -1 + 1 + 9 - 9 = 0$$

$$\begin{array}{r} x^2 - 9 \\ (x+1) \overline{) x^3 + x^2 - 9x - 9} \\ \underline{-(x^3 + x^2)} \\ -9x - 9 \end{array}$$

b. $\dots\dots\dots -9x - 9$

$$\begin{array}{r} -9x - 9 \\ \underline{-(x^3 + x^2)} \\ -9x - 9 \end{array}$$

$$\dots\dots\dots 0$$

$$x^2 - 9 = (x - 3)(x + 3)$$

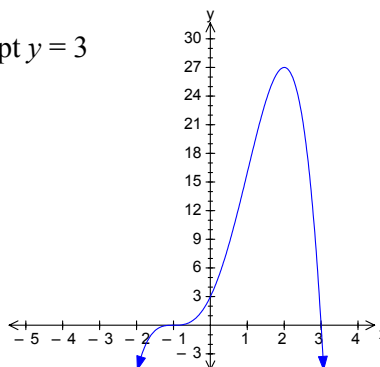
$$\therefore P(x) = (x + 1)(x - 3)(x + 3)$$

M2 + A1

Question 4

a. $POI(-1,0)$ x intercept $x = 3$, y intercept $y = 3$

Show POI and intercepts, correct shape



A4

b. Show asymptotes $y = -2$, $x = -3$ and intercepts, correct shape

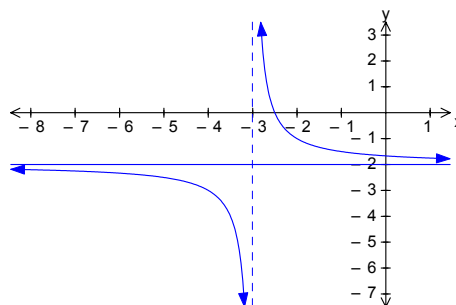
$$\text{let } x = 0, y = \frac{1}{3} - 2$$

$$y = -1\frac{2}{3}$$

$$\text{let } y = 0, 2 = \frac{1}{x + 3}$$

$$2x + 6 = 1$$

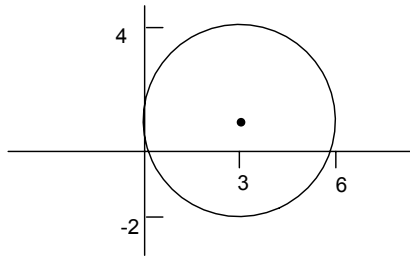
$$x = -2\frac{1}{2}$$



A4

Question 5

- a. Centre (3,1), radius = 3



- b. domain [0,6], range [-2,4]

A1 + A1

A1 + A1

Question 6

$$2^{3(2x+1)} = 2^{4(x-1)}$$

$$6x + 3 = 4x - 4$$

$$2x = -7$$

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

M2 + A1

Question 7

$$\log_2(x+1)^2 = 2$$

$$2^2 = (x+1)^2$$

$$4 = x^2 + 2x - 3$$

$$0 = x^2 + 2x - 3$$

$$0 = (x+3)(x-1)$$

$$x = -3 \text{..or..} 1$$

M2 + A1

Question 8

- a. use two points from the grid $(3, -4)$ and $(0, -7)$

$$m = \frac{-7 - -4}{0 - 3}$$

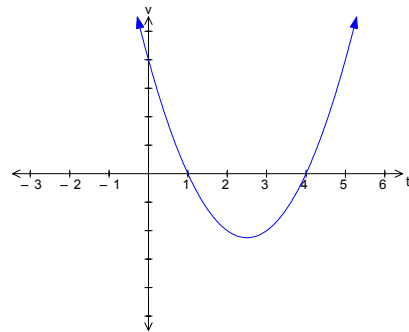
$$m = 1$$

$$\therefore \text{rate of change} = 1$$

M1 + A1

Question 9

- a. Stationary point at $x = 1$ maximum
Stationary point at $x = 4$ minimum



A2

Question 10

a.
$$\Pr(WWW) = \frac{4}{10} \times \frac{3}{9} \times \frac{2}{8}$$
$$= \frac{1}{30}$$

M1 + A1

b.
$$\Pr(BAA) + \Pr(ABA) + \Pr(AAB) = 3 \times \frac{5}{10} \times \frac{5}{9} \times \frac{4}{8}$$
$$= \frac{5}{12}$$

M1 + A1

Question 11**a.**

	L	L'	
C	0.45	0.20	0.65
C'	0.30	0.05	0.35
	0.75	0.25	1

A2

$$\begin{aligned} \text{b. } \Pr(C \mid L') &= \frac{\Pr(C \cap L')}{\Pr(L')} \\ &= \frac{0.20}{0.25} \\ &= \frac{4}{5} \end{aligned}$$

A1