

Gr 11 Mathematic Paper 1 June 2014

Question 1

$$\begin{aligned} 1.1.1 \quad x(x - 4) &= 0 \\ x &= 0 \checkmark \text{ or } x = 4 \checkmark \end{aligned} \quad (2)$$

$$\begin{aligned} 1.1.2 \quad x^2 + 6x - 16 &= 0 \\ (x + 8)(x - 2) &= 0 \checkmark \\ x &= -8 \checkmark; x = 2 \checkmark \end{aligned} \quad (3)$$

$$\begin{aligned} 1.1.3 \quad 5x^2 - 2x - 8 &= 0 \\ x &= \frac{-5 \pm \sqrt{(-2)^2 - 4(5)(-8)}}{2(5)} \checkmark \checkmark \\ x &= 1,48 \checkmark \text{ or } x = -1,08 \checkmark \end{aligned} \quad (4)$$

$$\begin{aligned} 1.2 \quad (3x + 2)(y^2 + 9) &= 0 \\ x &= -\frac{2}{3} \checkmark \text{ and } y \in \mathbb{R} \checkmark \text{ (since } y^2 + 9 \neq 0) \end{aligned} \quad (3)$$

$$\begin{aligned} 1.3 \quad \frac{-b + \sqrt{b^2 - 4ac}}{2a} &= 1 + \sqrt{2} \\ -b + \sqrt{b^2 - 4c} &= 2 + 2\sqrt{2} \\ -b &= 2 & b^2 - 4c &= 8 \checkmark \\ \therefore b &= -2 \checkmark & \therefore (-2)^2 - 4c &= 8 \\ & & \therefore c &= -1 \checkmark \end{aligned} \quad (3)$$

[15]

Question 2

$$2.1 \quad 4x^2 + 3x + r = 0$$

$$\text{Real roots } \Delta \geq 0 \quad b^2 - 4ac \geq 0 \quad \checkmark$$

$$3^2 - 4(4)r \geq 0 \quad \checkmark$$

$$9 \geq 16r$$

$$\frac{9}{16} \geq r \quad \checkmark \quad (3)$$

2.2 A race requires an athlete to run 10km and cycle 50km. James runs at a speed of x km/h and cycles at a speed 31 km/h faster.

He takes $\frac{10}{x}$ hours for the 10km run.

$$2.2.1 \quad t(\text{cycle}) = \frac{50}{x+31} \quad \checkmark \quad (1)$$

$$2.2.2 \quad \frac{10}{x} + \frac{50}{x+31} \quad \checkmark = \frac{2}{1} \quad \checkmark \quad (\times x(x+31))$$

$$10(x+31) + 50x = 2x(x+31) \quad \checkmark$$

$$2x^2 + 2x - 310 = 0$$

$$x^2 + x - 155 = 0 \quad \checkmark$$

$$x = \frac{-1 \pm \sqrt{1^2 - 4(1)(-155)}}{2(1)} \quad \checkmark$$

$$x = 11,96 \text{ or } -12,96 \quad \checkmark$$

$$\text{runs at } 11,96 \frac{\text{km}}{\text{h}} \quad \checkmark \quad (7)$$

[11]

Question 3

$$3.1.1 \quad (x + y)^{-1} \\ \frac{1}{x+y} \checkmark \quad (1)$$

$$3.1.2 \quad \frac{3x^4y^5}{12x^7y^0} \\ = \frac{y^5 \checkmark}{4x^3 \checkmark \checkmark} \quad (3)$$

$$3.1.2 \quad \frac{\sqrt{a} \cdot \sqrt[4]{b^3}}{(a^2b^3)^{\frac{1}{4}}} \\ = \frac{a^{\frac{1}{2}} \cdot \sqrt[4]{b^3} \checkmark}{a^{\frac{1}{2}} b^{\frac{3}{4}} \checkmark} \\ = 1 \checkmark \quad (4)$$

$$3.2.1 \quad 5 \cdot 5^x = 625 \\ 5^x = 125 \checkmark = 5^3 \checkmark \\ x = 3 \checkmark \quad (3)$$

$$3.2.2 \quad x\sqrt{x} = 8 \quad (\text{without a calculator}) \\ x^{\frac{3}{2}} = 8 \checkmark \\ \left(x^{\frac{3}{2}}\right)^{\frac{2}{3}} = (8)^{\frac{2}{3}} \checkmark \\ x = (\sqrt[3]{8})^2 \checkmark \\ x = 4 \checkmark \quad (4)$$

$$3.2.3 \quad 3^x(3^2 + 3^{-1}) \checkmark = 84$$

$$3^x = \frac{84}{9\frac{1}{3}} \checkmark = 9 = 3^2 \checkmark$$

$$x = 2 \checkmark \quad (4)$$

$$3.3 \quad \sqrt{x+6} = x$$

$$x+6 = x^2$$

$$x^2 - x - 6 = 0 \checkmark$$

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

$$x = 3 \text{ or } x = -2 \checkmark (\text{both answ})$$

$$\checkmark (x = 3 \text{ only}) \quad (5)$$

[24]

Question 4

$$4.1 \quad \text{JACKETSJACKETSJACKETSJAC...}$$

$$\frac{2235}{7} = 319 \text{ rem } 2 \quad \therefore A \checkmark \checkmark \quad (2)$$

$$4.2 \quad (x-8) - (-3x) = (-3x) - (1-5x) \checkmark$$

$$4x - 8 = 2x - 1$$

$$2x = 7 \checkmark$$

$$x = \frac{7}{2} \checkmark \quad (3)$$

[5]

Question 5

$$T_n = -2(n - 3)^2 + 15.$$

$$5.1 \quad T_1 = -2(1 - 3)^2 + 15 = 7 \checkmark$$

$$T_2 = 13 \checkmark$$

$$T_3 = 15 \checkmark \quad (3)$$

$$5.2 \quad T_3 \checkmark \quad (1)$$

$$5.3 \quad 7 \quad 13 \quad 15$$

$$6 \quad 2$$

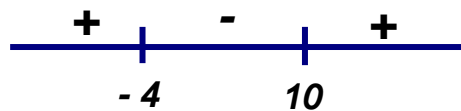
$$-4 \checkmark \checkmark \quad (2)$$

$$5.4 \quad -2(n - 3)^2 + 15 > -83 \checkmark$$

$$-2(n^2 - 6n + 9) \checkmark + 15 + 83 > 0$$

$$n^2 - 6n - 40 < 0 \checkmark$$

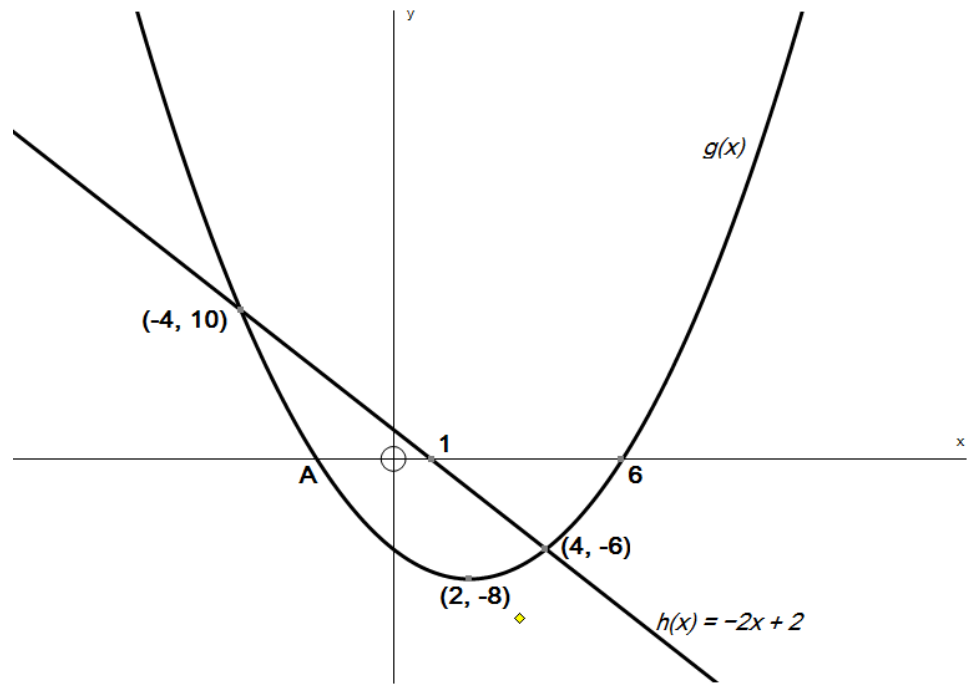
$$(n - 10)(n + 4) < 0 \checkmark$$



$$-4 < n < 10 \checkmark n \in N \checkmark \quad (6)$$

[12]

Question 6



6.1 $A(-2; 0)$ ✓✓ (2)

6.2 $y \geq -8$ ✓✓ (2)

6.3 $m = -2$ ✓✓ (2)

6.4 $y = -2x - 2$ ✓ (2)

6.5 $g(x) = a(x - 2)^2 - 8$ ✓

sub (4; -6)

$-6 = a(4 - 2)^2 - 8$ ✓

$a = \frac{1}{2}$ ✓

$g(x) = \frac{1}{2}(x - 2)^2 - 8$ ✓ (4)

6.6 $\frac{g(x)}{h(x)} \geq 0$: $x \leq -2$ ✓ or $1 < x \leq 6$ ✓✓ (3)

[15]

Question 7

Given: $k(x) = \frac{6}{x+2} + 4$ and $g(x) = x + 1$.

7.1 $x \in R; x \neq -2$ ✓ (1)

7.2 $\frac{6}{x+2} + 4 = x + 1$ ✓

$$\frac{6}{x+2} = \frac{x-3}{1}$$

$$(x + 2)(x - 3) = 6$$
 ✓

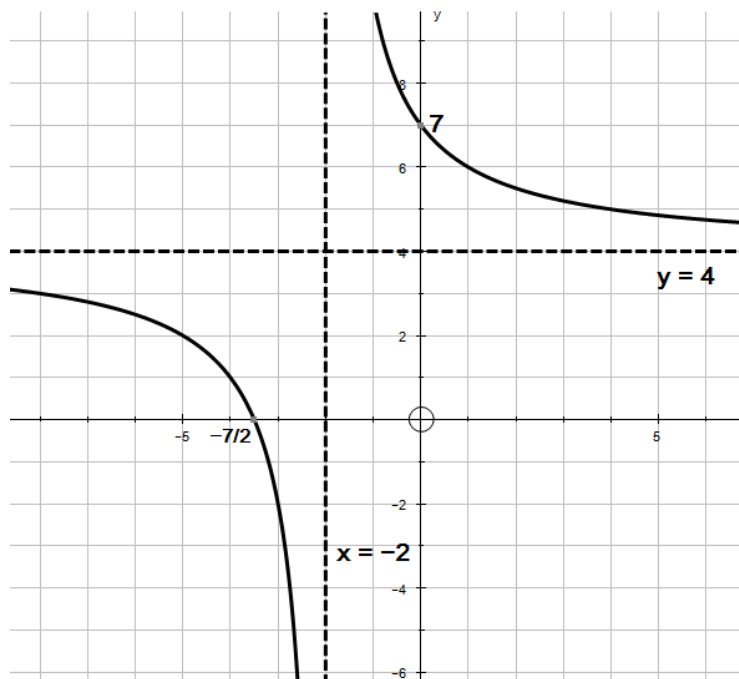
$$x^2 - x - 12 = 0$$
 ✓

$$(x - 4)(x + 3) = 0$$
 ✓

$$x = 4 \text{ or } x = -3$$
 ✓

$$y = 5 \text{ or } y = -2$$
 ✓ (7)

7.3



✓✓ $x - int$ ✓ $y - int$

✓ *shape*

$$x = -2 \text{ ✓ } y = 4 \text{ ✓}$$

cant just be -2, 4 at x - axes)

(6)

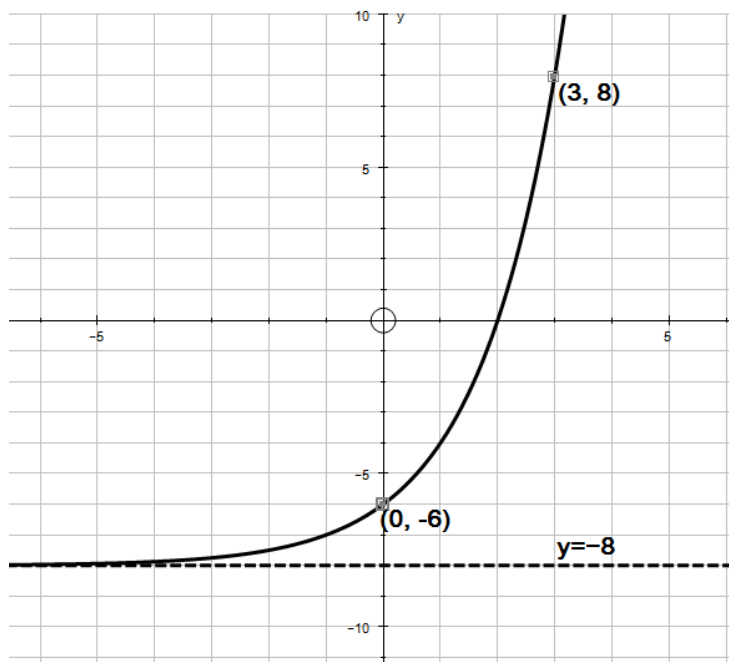
[14]

Question 8

An exponential graph with equation $y = 4 \cdot a^{x+p} + q$ has the following properties:

- Domain: $x \in \mathbb{R}$
- Range: $y \in \mathbb{R}, y > -8$
- The y -intercept is $y = -6$
- The graph passes through the point $(3; 8)$

8.1



✓ $y = -8$

✓ y -int

✓ $(3; 8)$

✓ *shape*

(4)

[4]