



GRADE 10 IEB STANDARDISATION PROJECT
NOVEMBER 2012

MATHEMATICS: PAPER I

MARKING GUIDELINES

Time: 2 hours

100 marks

These marking guidelines are prepared for use by examiners and sub-examiners, all of whom are required to attend a standardisation meeting to ensure that the guidelines are consistently interpreted and applied in the marking of candidates' scripts.

The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines. It is also recognised that, without the benefit of attendance at a standardisation meeting, there may be different interpretations of the application of the marking guidelines.

QUESTION 1

(a) (1) $3a^2 + 5a - 2 = (3a - 1)(a + 2)$ (2)

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

(3) $\frac{a^2}{9}(3 - b) + \frac{b^2}{16}(b - 3)$
 $= -\frac{a^2}{9}(b - 3) + \frac{b^2}{16}(b - 3)$ ✓ ✓
 $= (b - 3)\left(\frac{b^2}{16} - \frac{a^2}{9}\right)$ ✓ ✓
 $= (b - 3)\left(\frac{b}{4} - \frac{a}{3}\right)\left(\frac{b}{4} + \frac{a}{3}\right)$ ✓ (4)

OR

$\frac{a^2}{9}(3 - b) - \frac{b^2}{16}(3 - b)$
 $(3 - b)\left(\frac{a^2}{9} - \frac{b^2}{16}\right)$
 $(3 - b)\left(\frac{a}{3} - \frac{b}{4}\right)\left(\frac{a}{3} + \frac{b}{4}\right)$

(b) $\frac{25^x - 1}{5^x + 1}$
 $= \frac{5^{2x} - 1}{5^x + 1}$
 $= \frac{\cancel{(5^x + 1)}(5^x - 1)}{\cancel{5^x + 1}}$ ✓
 $= 5^x - 1$ ✓ (2)

[11]

QUESTION 2

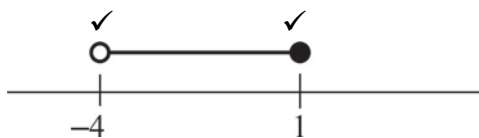
(a) (1) $x^2 - 2x = 15$
 $x^2 - 2x - 15 = 0$
 $(x - 5)(x + 3) = 0$ ✓
 $x = 5$ or $x = -3$ ✓ (2)

(2) $\frac{x}{3} - \frac{x-2}{4} = 2 - \frac{x}{2}$
 $4x - 3(x-2) = 12(2) - 6x$ ✓
 $4x - 3x + 6 = 24 - 6x$ ✓
 $7x = 18$ ✓
 $x = \frac{18}{7}$ ✓ (5)

(3) $4^{x-1} = 8$
 $2^{2x-2} = 2^3$
 $2x - 2 = 3$ ✓
 $2x = 5$
 $x = \frac{5}{2}$ ✓ (4)

(b) $x + 2y = 1$ ①
 $2x + 3y = 6$ ②
 ①: $x = 1 - 2y$ ✓
 ②: $2(1 - 2y) + 3y = 6$ ✓
 $2 - 4y + 3y = 6$ ✓
 $-y = 4$
 $y = -4$ ✓
 $x = 9$ ✓ (5)

(c) $-1 \leq 1 - 2x < 9$
 $-2 \leq -2x < 8$
 $1 \geq x > -4$ ✓ change inequality sign



(5)
[21]

QUESTION 3

(a) (1) $-1; -8; -27; \dots$
 $4^{\text{th}} \text{ term} = (-4)^3 = -64 \checkmark$
 $n^{\text{th}} \text{ term} = (-n)^3 = -n^3 \checkmark$ (2)

(2) $3; 0; -3; \dots$
 $4^{\text{th}} \text{ term} = -6 \checkmark$
 $n^{\text{th}} \text{ term} = 6 - 3n$ (3)

(b) $-4; \overset{\checkmark}{3}; \overset{\checkmark}{4}; 7; 12; 19; 28 \checkmark^m$
 $\underbrace{-1 \quad 1 \quad 3 \quad 5 \quad 7 \quad 9}$ (3)

(c) $\sqrt{16} < \sqrt{18} < \sqrt{25}$
 \checkmark
 $\underline{4} < \sqrt{18} < \underline{5} \checkmark$ (2)

(d) $\left(1 - \frac{1}{3}\right)\left(1 - \frac{1}{4}\right)\left(1 - \frac{1}{5}\right)\left(1 - \frac{1}{6}\right)\left(1 - \frac{1}{7}\right) \dots \left(1 - \frac{1}{74}\right)\left(1 - \frac{1}{75}\right)$
 $= \left(\frac{2}{\cancel{3}}\right)\left(\frac{\cancel{3}}{\cancel{4}}\right)\left(\frac{\cancel{4}}{\cancel{5}}\right)\left(\frac{\cancel{5}}{\cancel{6}}\right)\left(\frac{\cancel{6}}{\cancel{7}}\right) \dots \left(\frac{\cancel{73}}{\cancel{74}}\right)\left(\frac{\cancel{74}}{75}\right) \checkmark^m \checkmark^a$
 $= \frac{2}{75} \checkmark$ (3)

[13]

QUESTION 4

(a) $\frac{x^2 - 2x + 1}{x - 1} - \frac{x^2 + x + 1}{x^3 - 1}$ $\frac{x^2 - 2x + 1}{x - 1} - \frac{x^2 + x + 1}{(x - 1)(x^2 + x + 1)} \checkmark$
 $= \frac{(x - 1)^2}{x - 1} \checkmark - \frac{x^2 + x + 1}{(x - 1)(x^2 + x + 1)} \checkmark$ or leave as $\frac{x^2 - 2x + 1}{x - 1} - \frac{1}{x - 1} \checkmark \checkmark$
 $= x - 1 - \frac{1}{x - 1} \checkmark$ $= \frac{x^2 - 2x}{x - 1} \checkmark^a \checkmark^m$
 $= \frac{(x - 1)^2 - 1}{x - 1}$
 $= \frac{x^2 - 2x}{x - 1} \checkmark$ (5)

(b) $(x^2 - x + 4) + 5x \checkmark$ $(x + 2)^2 - (x^2 - x + 4)$
 $= x^2 + 4x + 4 \checkmark$ **OR** $= x^2 + 4x + 4 - x^2 + x - 4 \checkmark^m$
 $= (x + 2)^2$ $= 5x \checkmark^a$
 $\therefore \text{Add } 5x$ (2)

[7]

QUESTION 5

(a) Increase in the cost of crude oil:
 $= \$150 - \$113,22$
 $= \$36,78 \checkmark$

\therefore Percentage increase in the cost of crude oil:

$$\frac{36,78}{113,22} \checkmark$$

$$= 0,324854266$$

$$= 32,5\% \checkmark \quad (\text{to 1 dp}) \quad (3)$$

(b) Increase in the cost of one dollar
 $= R9,20 - R7,65$
 $= R1,64 \checkmark$

\therefore Percentage increase in the cost of one dollar:

$$\frac{1,64}{7,65} \checkmark = 0,2169312169$$

$$= 21,7\% \checkmark \quad (\text{to 1 dp}) \quad (3)$$

(c) The expected increase in the petrol price will be 21,7%

$$\therefore \text{New petrol price} = 10,41 + (0,217 \times 10,41) \quad \text{OR} \quad 10,41 (1 + 0,217)$$

$$= R12,67 \checkmark \quad (3)$$

[9]

QUESTION 6

(a) (1) Domain: $x \in \mathbb{R}$ ✓ Alternative notation: $-\infty < x < \infty$
 Range: $y \geq -4$ ✓ $y \in [-4; \infty)$ (2)

(2) Domain: $x \leq 2$ ✓ $x \in (-\infty; 2]$
 Range: $-1 < y \leq 3$ ✓ $y \in (-1; 3]$ (2)

(b) (1) $f(x) = ax^2 + q$
 $f(0) = 2$
 $\therefore \underline{q = 2}$ ✓

$\therefore f(x) = ax^2 + 2$
 subs (2;5): $5 = a(2)^2 + 2$ ✓

$$3 = 4a$$

$$\therefore \underline{a = \frac{3}{4}}$$
 ✓

$g(x) = m^x + t$
 horizontal asymptote: $y = 1$ $\therefore \underline{t = 1}$ ✓

$g(x) = m^x + 1$
 subs (2;5): $5 = m^2 + 1$ ✓

$$4 = m^2$$

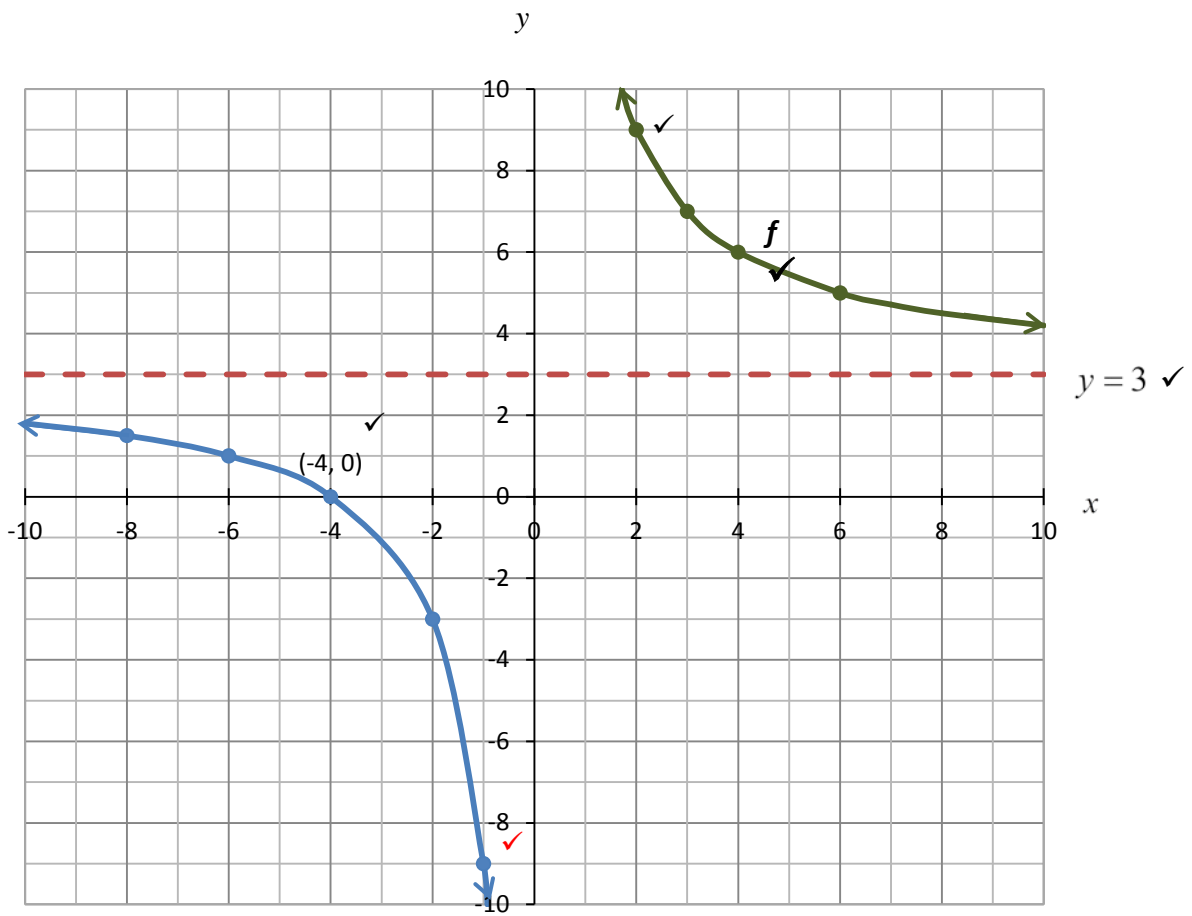
$$\therefore \underline{m = 2}$$
 ✓ (6)

(2) $f(x) \leq g(x)$

$\therefore 0 \leq x \leq 2$ ✓ (2)
[12]

QUESTION 7

(a)



(5)

(b) $g(x) = \frac{12}{x} - 2$

(2)

[7]

QUESTION 8

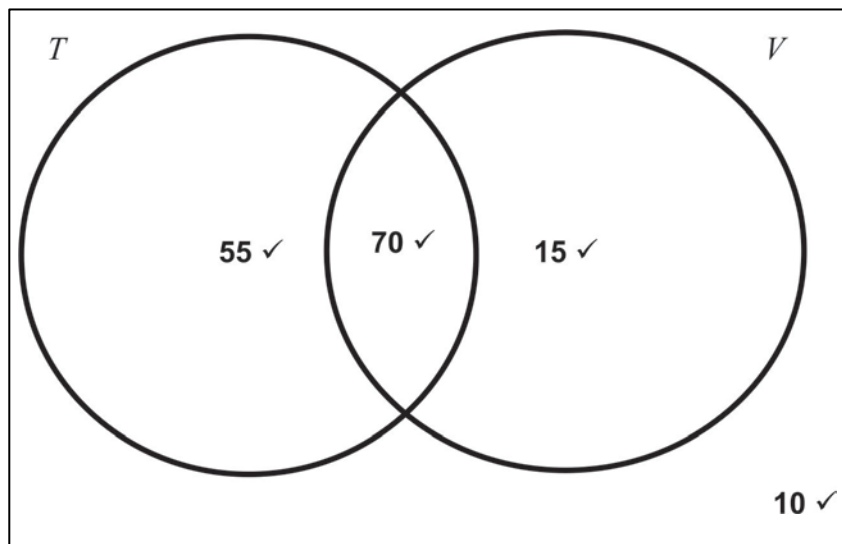
(a) $h(t) = -3t^2 + 6t + 3$
 $h(2) = -3(2)^2 + 6(2) + 3 \checkmark$ Subst $t = 2$
 $\therefore h(2) = 3 \text{ m} \checkmark$ (2)

(b) $-3t^2 + 6t + 3 = 6 \checkmark$ equating $h(t) = 6$
 $-3t^2 + 6t - 3 = 0 \checkmark$
 $t^2 - 2t + 1 = 0$
 $(t - 1)^2 = 0 \checkmark$
 $\therefore t = 1 \text{ sec} \checkmark$ (4)
[6]

QUESTION 9

(a) (1) $n(T \text{ or } V) = n(T) + n(V) - n(T \text{ and } V) \checkmark$ Alternative solution:
 $= 125 + 85 - 70 \checkmark$
 $= 140 \checkmark$ $55 + 70 + 15 = 140$ (3)

(2) $n(S) = 150$



(3) (i) $\frac{85}{150} = \frac{17}{30} \checkmark$ (1)

(ii) $\frac{15}{150} = \frac{1}{10} \checkmark$ (1)

(iii) $\frac{10}{150} = \frac{1}{15} \checkmark$ (1)

(b) (1) $\frac{2012}{7} = 287 \text{ rem } 3 \checkmark^m$ $\therefore 2012^{\text{th}}$ letter: L \checkmark (2)

(2) $\frac{288}{2012} = \frac{72}{503} \checkmark$ (2)

[14]

[Total: 100 marks]