



**higher education  
& training**

Department:  
Higher Education and Training  
**REPUBLIC OF SOUTH AFRICA**

# **MARKING GUIDELINE**

**NATIONAL CERTIFICATE (VOCATIONAL)**

**NOVEMBER EXAMINATION 2012**

**MATHEMATICS  
(First Paper)  
NQF LEVEL 3**

**30 OCTOBER 2012**

**This marking guideline consists of 10 pages.**



✓ = 1 MARK  $\sqrt{\substack{y=3x^2-4}}$  =  $\frac{1}{2}$  MARK

**QUESTION 1**

1.1.1  $(-3+2j)-(-2+5j)$   
 $-3+2j+2-5j$   
 $-1-3j$  (2)

1.1.2  $(-3+j^3)(2-3j^3)$   
 $-6+2j^3+9j^3-3j^6$   
 $-6+11j^3-3j^6$  ✓  
 $-6+11j^2j-3(j^2)^3$   
 $-6-11j+3$   
 $-3-11j$  ✓ (4)

*Carry Forward one mistake only and give a maximum of 3 marks*

1.1.3  $(\sqrt{2}-\sqrt{-16})(\sqrt{2}+\sqrt{-9})$   
 $(\sqrt{2}-4j)(\sqrt{2}+3j)$   
 $2+3\sqrt{2}j-4\sqrt{2}j-12j^2$   
 $2-\sqrt{2}j+12$   
 $14-\sqrt{2}j$  (3)

1.1.4  $(-1+i)(3+4i)(3i)$  or  $(-1+i)(9i+12i^2)$   
 $(-3-4i+3i+4i^2)(3i)$   
 $(-3-i-4)(3i)$   
 $(-7-i)(3i)$   
 $-21i-3i^2$  ✓  
 $-21i+3$  ✓

$(-1+i)(9i-12)$   
 $-9i+12+9i^2-12i$   
 $-21i+12-9$   
 $3-21i$  ✓ (3)



1.2 
$$\frac{1.25cis35^\circ \times 3.1cis45^\circ}{2cis60^\circ}$$

$$\frac{3.875cis80^\circ}{2cis60^\circ}$$

$$1.938cis(80^\circ - 60^\circ)$$

$$1.938cis(20^\circ)$$

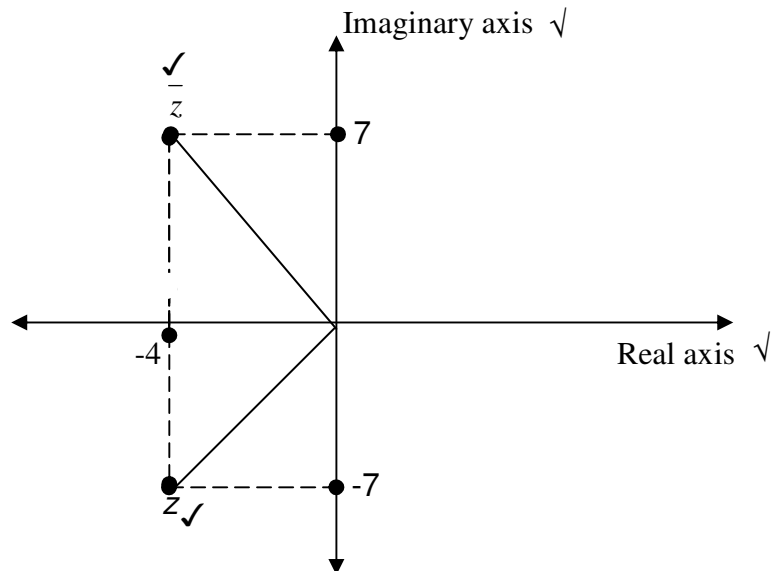
Question paper uses dot instead of comma:

Accept: 
$$\frac{75cis80^\circ}{2cis60^\circ} = 37,5cis20^\circ$$

If answer only is given  $1,938cis20^\circ$  (3)

1.3 1.3.1 
$$\bar{Z} = -4 + 7i$$
 (1)

1.3.2



One mark for labelling the axes  
 One mark each for clearly indicating z and its conjugate  
 One mark for any point on the axis (4)



MATHEMATICS L3  
(First Paper)

1.3.3  $z = -4 - 7i$  OR

$$r = \sqrt{(-4)^2 + (-7)^2} \checkmark$$

$$r = \sqrt{65} \checkmark \text{ or } 8,062$$

$$r = \sqrt{z \times \bar{z}}$$

$$r = \sqrt{(-4 - 7j)(-4 + 7j)}$$

$$r = \sqrt{16 - 28j + 28j - 49j^2}$$

$$r = \sqrt{16 + 49}$$

$$r = \sqrt{65}$$

(2)

1.3.4  $\theta = \tan^{-1}\left(\frac{7}{4}\right)$

$$\theta = 60,125^\circ \checkmark$$

$$\theta = 180 + 60,255 \checkmark$$

$$\theta = 240,255 \checkmark$$

(3)

1.4  $\frac{4 + 5j}{-3 - 2j}$

$$\frac{4 + 5j}{-3 - 2j} \times \frac{-3 + 2j}{-3 + 2j} \checkmark$$

$$\frac{-12 + 8j - 15j + 10j^2}{9 - 6j + 6j - 4j^2} \checkmark$$

$$\frac{-22 - 7j}{13} \checkmark$$

$$\frac{-22}{\sqrt{13}} - \frac{7j}{\sqrt{13}}$$

OR  $-1,692 - 0,538j$

(5)  
[30]

## QUESTION 2

2.1  $2 + x - x^2 \leq 0$

$$-x^2 + x + 2 \leq 0$$

$$x^2 - x - 2 \geq 0 \checkmark$$

$$(x - 2)(x + 1) \geq 0 \checkmark$$

$$x \leq -1 \checkmark \text{ or } x \geq 2 \checkmark$$

OR  $\overset{\checkmark}{(2-x)}\overset{\checkmark}{(1+x)} \leq 0$   
 $\checkmark \qquad \checkmark$   
 $x \leq -1 \text{ or } x \geq 2$

(3)



MATHEMATICS L3  
(First Paper)

$$2.2 \quad -2a^2 + 11a + 6 = 0$$

$$a^2 - \frac{11a}{2} - 3 = 0 \quad \checkmark$$

$$a^2 - \frac{11}{2}a = 3 \quad \checkmark$$

$$a^2 - \frac{11a}{2} + \frac{121}{16} = 3 + \frac{121}{16} \quad \checkmark$$

$$\left(a - \frac{11}{4}\right)^2 = \pm \sqrt{\frac{169}{16}}$$

$$a - \frac{11}{4} = \pm \frac{13}{4}$$

$$a = 6 \quad \text{or} \quad a = -\frac{1}{2}$$

(4)

$$2.3 \quad y = 3x + 2 \dots\dots\dots(1)$$

$$y = 3x^2 + 6x - 4 \dots\dots\dots(2)$$

$$3x^2 + 6x - 4 = 3x + 2 \quad \checkmark$$

$$3x^2 + 6x - 3x - 4 - 2 = 0$$

$$3x^2 + 3x - 6 = 0 \quad \checkmark$$

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

$$(x + 2)(x - 1) = 0 \quad \checkmark$$

$$x = -2 \quad \& \quad x = 1$$

$$y = -4 \quad \& \quad y = 5 \quad \checkmark \quad \text{OR} \quad (-2; -4) \text{ and } (1; 5)$$

(6)

$$2.4 \quad 2.4.1 \quad \left(1 - \frac{x}{y}\right) \div \left(\frac{x-y}{y}\right)$$

$$\sqrt{\left(\frac{y-x}{y}\right) \div \left(\frac{x-y}{y}\right)}$$

$$\frac{y-x}{y} \times \frac{y}{(x-y)}$$

$$\frac{\sqrt{(x-y)}}{y} \times \frac{y}{(x-y)}$$

$$= -1 \quad \checkmark$$

(3)



2.4.2

$$\frac{2}{(x-y)^2} - \frac{3}{y^2 - x^2}$$

$$\frac{2}{(x-y)(x-y)} - \frac{3}{-(x^2 - y^2)} \checkmark \text{ Also allow } (y-x)(y+x) \text{ in } x^2 - y^2$$

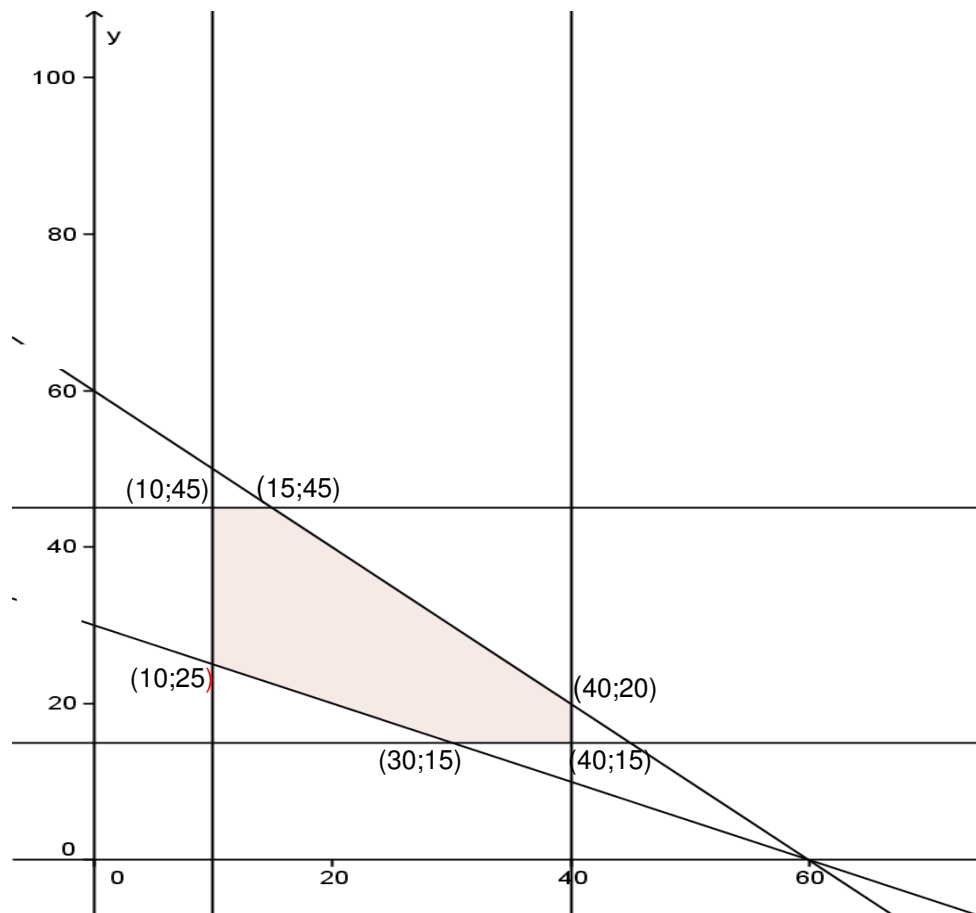
$$\frac{2}{(x-y)(x-y)} + \frac{3}{(x-y)(x+y)} \checkmark$$

$$\frac{2(x+y) + 3(x-y)}{(x-y)(x-y)(x+y)} \checkmark$$

$$\frac{5x-y}{(x-y)(x-y)(x+y)} \checkmark \text{ OR } \frac{y-5x}{(x-y)(y^2-x^2)}$$

(4)

2.5.1



one mark for each graph – coordinates are only a guideline for marking. They need not be shown.

(6)

2.5.2

Feasible region on the graph  $\checkmark$

(1)



2.5.3  $P = 3(15) + 5(45)$   
 $P = 270$   
 $\sqrt{15}$  T-shirts and  $\sqrt{45}$  trousers

Give full marks for correct answer only.

QP did not specify that it must be drawn on graph paper. Exact co-ordinates might be difficult to establish. Give two marks for boundary search using their co-ordinates.

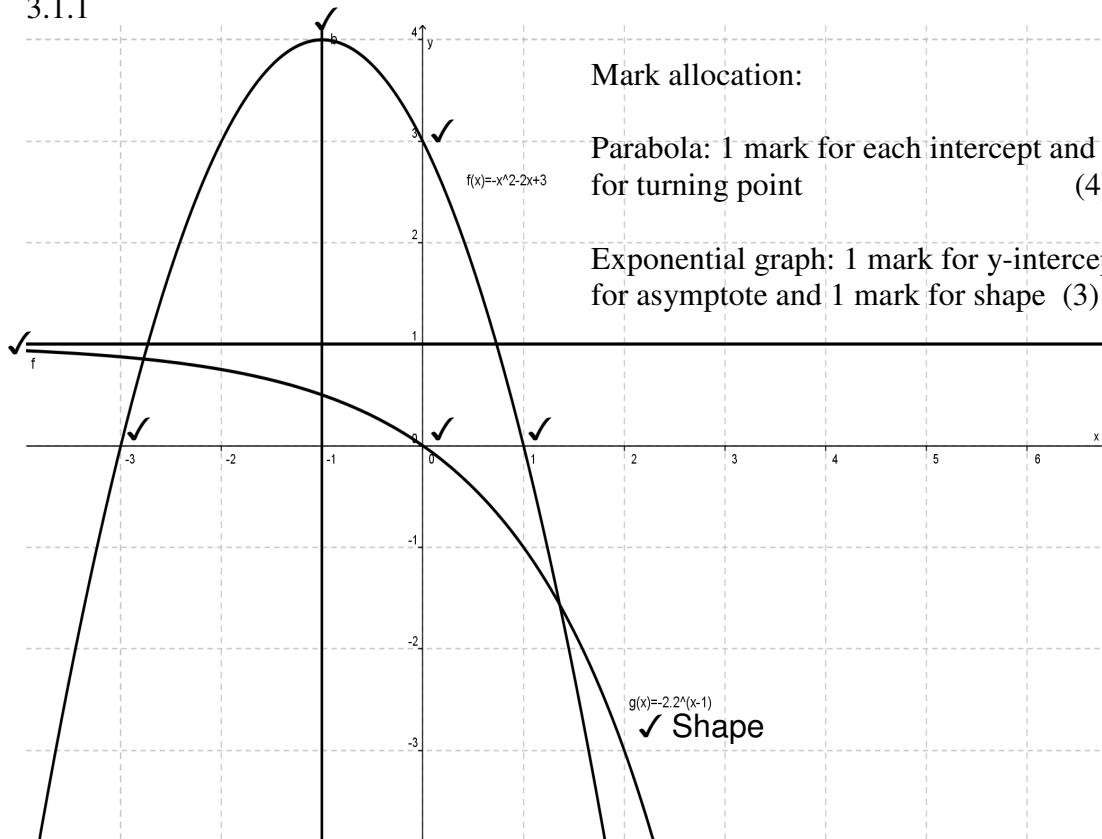
x	y	P
10	45	255
10	25	155
30	15	165
40	15	195
40	20	220
15	45	270

Boundary search  
 ✓✓

(3)  
 [30]

QUESTION 3

3.1 3.1.1



(7)

3.1.2  $x = -1$  ✓ (1)

3.1.3  $\mathfrak{R} = \{y / y < 1, y \in R\}$   
 (accept  $y < 1$ ) (1)

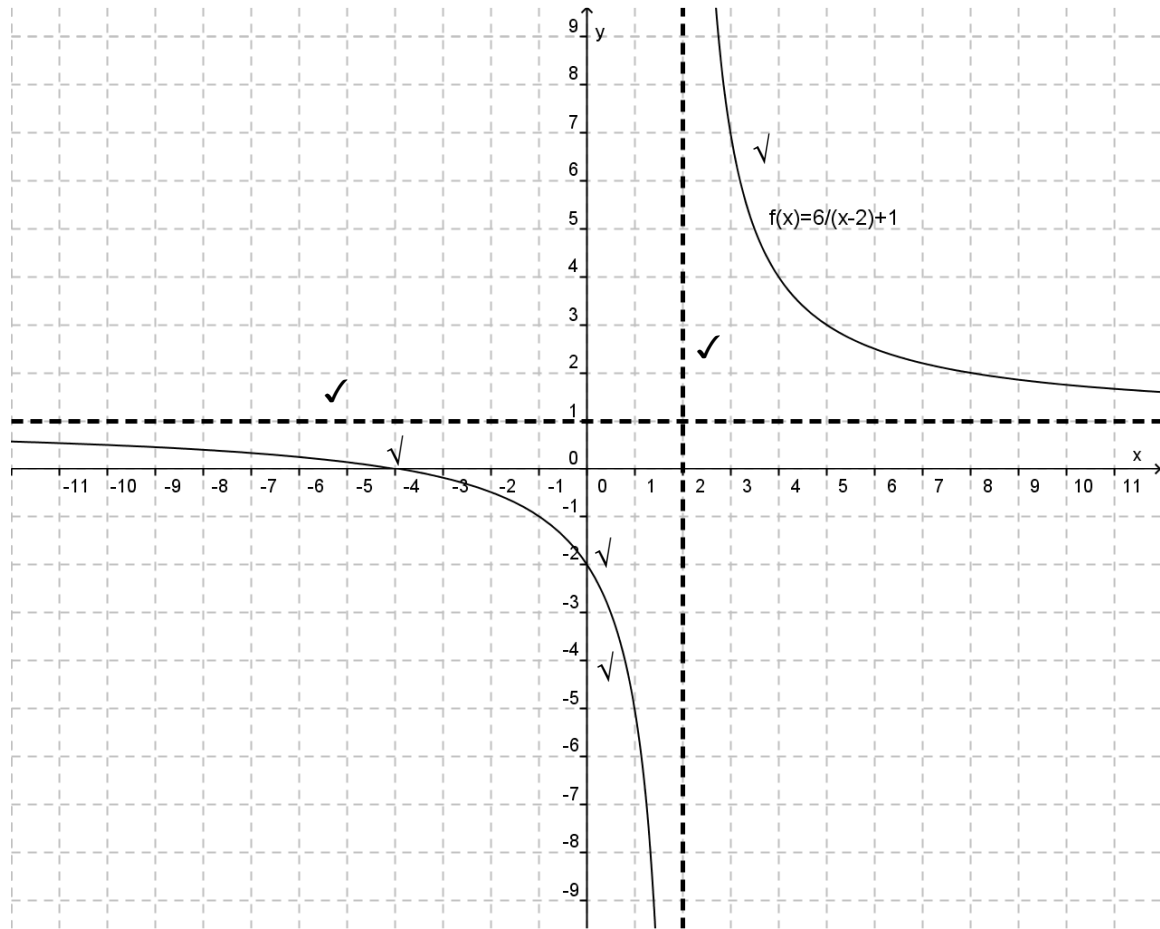
3.2 3.2.1  $y = 1$  ✓ and  $x = 2$  ✓ (2)

3.2.2  $x = 2$  ✓ (1)



MATHEMATICS L3  
(First Paper)

3.2.3



Mark allocation:

1 mark for each asymptote; half mark for each intercept; and half mark for each shape/arm (4)

3.2.4  $y = \frac{6}{x-2} + 1$  ✓  
 $y = -2$  ✓ (2)

3.2.5 Domain:  $x \in \mathbb{R}; x \neq 2$  ✓ Accept  $x > 2$  and  $x < 2$ ; or  $(-\infty; 2)$  and  $(2; \infty)$   
 Range:  $y \in \mathbb{R}; y \neq 1$  ✓ Accept  $y > 1$  and  $y < 1$ ; or  $(-\infty; 1)$  and  $(1; \infty)$  (2)  
**[20]**





## QUESTION 4

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

$f(x+h) = 2(x+h)^2 + 1 \checkmark$

$f(x+h) = 2(x^2 + 2xh + h^2) + 1$

$$\frac{dy}{dx} = \lim_{h \rightarrow 0} \frac{2x^2 + 4xh + 2h^2 + 1 - (2x^2 + 1)}{h} \checkmark$$

$$\frac{dy}{dx} = \lim_{h \rightarrow 0} \frac{4xh + 2h^2}{h}$$

$$\frac{dy}{dx} = \lim_{h \rightarrow 0} \frac{h(4x + 2h)}{h} \checkmark$$

$$\frac{dy}{dx} = 4x + 2(0)$$

$$\frac{dy}{dx} = 4x \checkmark$$

(4)

4.2 
$$\lim_{x \rightarrow 3} \frac{3x^2 + 13x - 66}{x - 3}$$
$$= \lim_{x \rightarrow 3} \frac{(3x + 22)(x - 3)}{x - 3} \checkmark$$

$$= \lim_{x \rightarrow 3} (3x + 22) \checkmark$$

$$3(3) + 22 = 31 \checkmark$$

(3)

4.3 4.3.1 
$$y = \sqrt{x^3} - \frac{1}{3x} + qx^2$$
$$y = x^{\frac{3}{2}} - \frac{1}{3}x^{-1} + qx^2 \checkmark$$
$$\frac{dy}{dx} = \frac{3}{2}x^{\frac{1}{2}} + \frac{1}{3}x^{-2} + 2qx$$

$$\frac{dy}{dx} = \frac{3}{2}\sqrt{x} + \frac{1}{3x^2} + 2qx$$

(3)



$$4.3.2 \quad y = \frac{3}{x} \left( \frac{4p}{x} - 5\sqrt{x} \right) + 6p^2$$

$$y = \frac{12p}{x^2} - \frac{15\sqrt{x}}{x} + 6p^2$$

$$y = 12px^{-2} - 15x^{-\frac{1}{2}} + 6p^2$$

$$\frac{dy}{dx} = -24px^{-3} + \frac{15}{2}x^{-\frac{3}{2}}$$

$$\frac{dy}{dx} = -\frac{24p}{x^3} + \frac{15}{2\sqrt{x^3}} \quad (4)$$

$$4.3.3 \quad xy = 5$$

$$y = \frac{5}{x} \quad \checkmark$$

$$y = 5x^{-1}$$

$$\frac{dy}{dx} = -5x^{-2} \quad \checkmark$$

$$\frac{dy}{dx} = \frac{-5}{x^2} \quad \checkmark \quad (2)$$

$$4.4 \quad v = 256x - \frac{4}{3}x^3 \quad \checkmark$$

$$\frac{dv}{dx} = 256 - 4x^2 \quad \checkmark$$

$$0 = 256 - 4x^2 \quad \checkmark$$

$$0 = 64 - x^2$$

$$(8 - x)(8 + x) = 0$$

$$x = 8 \quad \text{or} \quad x = -8 \quad \checkmark$$

$$\therefore x = 8$$

$$\text{breadth} = 8\text{cm}$$

$$\text{length} = 64\text{cm} \quad \checkmark \quad (\text{Subtract half mark for each dimension not shown})$$

$$\text{height} = 2.67\text{cm}$$

(4)  
**[20]**

**TOTAL: 100**