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 4

29 OCTOBER 2012

This marking guideline consists of 12 pages.

✓ = MARK ✓ = ½ MARK

QUESTION 1

1.1 1.1.1 $q = 1$ ✓ 1 M correct answer (1)

1.1.2 Function ✓ 1 M correct answer (1)

1.1.3

$y = 2x^2 + 1$

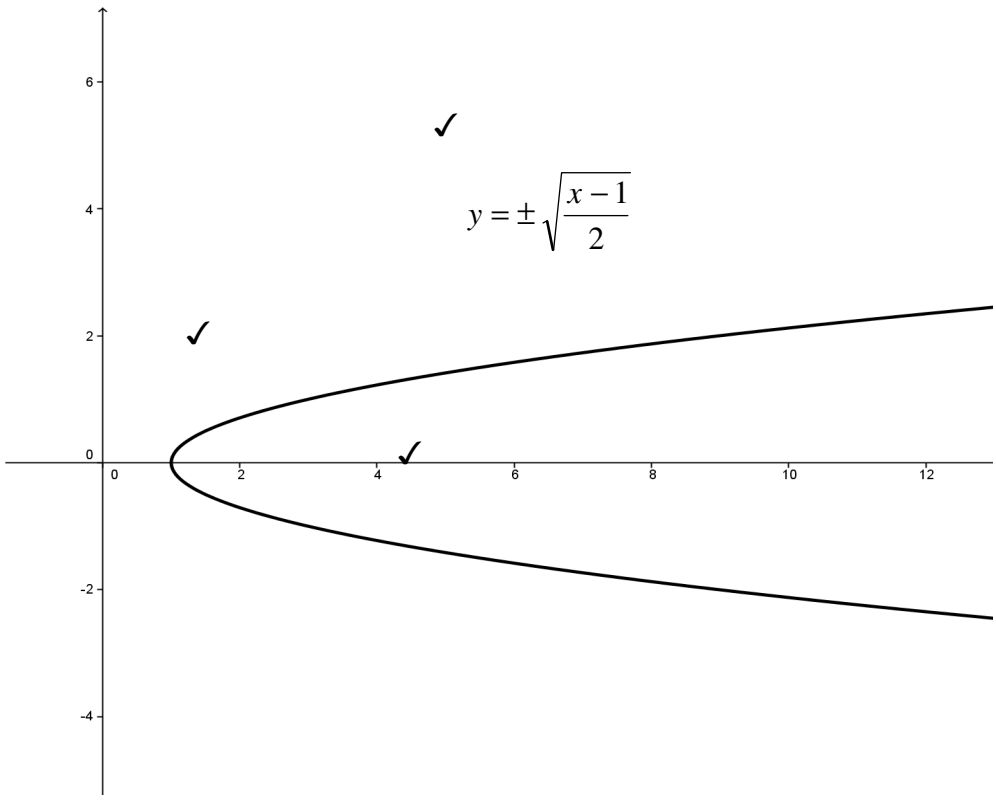
$x = 2y^2 + 1$ √ ½ Finding inverse

$2y^2 = x - 1$ ½ Simply

$y^2 = \frac{x-1}{2}$ √

$y = \pm\sqrt{\frac{x-1}{2}}$ ✓ 1 M correct answer (2)

1.1.4



(3)

1.2. $x-2=0$

$(x-2)=ax^3-x^2-4x+b$

$x=2 \quad a(2)^3-(2)^2 \quad 4(2)+b$ √ Substitute

$0=8a-4-8+b$ Simply eq (1)

$0=8a \quad b-12$ ..... (1)

$factor \ (x+1) \ remainder=6$ √ For 6- remainder

$6=a(-1)^3-(-1)^2-4(-1)+b$ Simply

$6=-a-1+4+b$

$6+1-4=-a+b$ Equation (2)

$3=-a+b$.....(2) √

$(1)-(2)$ Simply

$8a+b-12=0$ √

$-a+b-3=0$

$9a-9=0$

$a=\frac{9}{9}$ ✓ Value of (a)

$a=1$

$Sub \ in \ a=1 \ (1) \ or \ (2)$ Substitution

$-a+b-3=0$ Simply

$-1+b-3=0$ ✓ Value of b (4)

$b=4$

1.3 1.3.1 $Let \ A=x \qquad B=y$

$30x+40y\leq 400$

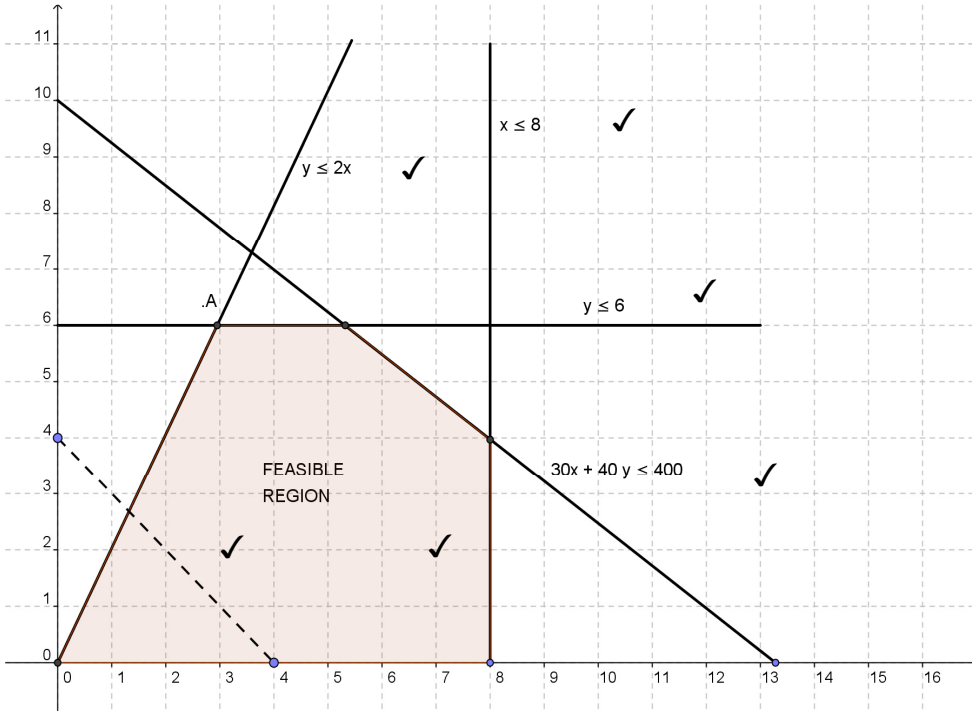
$y\leq 6$ ✓

$x\leq 8$ ✓

$\frac{1}{2}y\leq x$ ✓

✓ (4)

1.3.2



(6)

1.3.3 By using search line: Maximum at (8 ; 4) 1 M Co-ordinates
Type A = 4 and Type B = 8 ✓
Evidence of search line MUST be shown ✓1 M search line (2)

QUESTION 2

2.1 $f(x) = -3x^2 + 4$

$\lim_{x\to 0} \frac{-3(x+h)^2 + 4 - (-3x^2 + 4)}{h}$ ✓ Sub in equation

$\lim_{x\to 0} \frac{-3(x^2 + 2xh + h^2) + 4 + 3x^2 - 4}{h}$ √ Simplify

$\lim_{x\to 0} \frac{-3x^2 - 6xh - 3h^2 + 4 + 3x^2 - 4}{h}$ ✓ Remove Brackets

$\lim_{x\to 0} \frac{-6xh - 3h^2}{h}$ √ Simplify

$\lim_{x\to 0} \frac{-3h(2x + h^2)}{h}$ √ Com Factor

$lim_{x\to 0} -3(2x + h)$ √ Simply

$= -3(2x + 0)$

$= -6x$ ✓ Final answer (5)

2.2 2.2.1

$$f(x)=\frac{1}{x}-\frac{3x^2+4x^5}{x^4}+2a$$ Simply 2 terms

$$f(x)=x^{-1}-\frac{3x^2}{x^4}-\frac{4x^5}{x^4}+2a$$ Differante

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

$$f'(x)=-x^{-2}+6x^{-3}-4+0$$ ✓

$$=-\frac{1}{x^2}+\frac{6}{x^3}-4$$ ✓

✓
✓ (4)

2.2.2

$$f(x)=3x^3.e^x$$

$$\frac{dy}{dx}=u.\frac{dv}{dx}+v.\frac{du}{dx}$$

$u=3x^3 \quad v=e^x$ √ dv/dx= and du/dx 1 mark

$\frac{du}{dx}=9x^2 \quad \frac{dv}{dx}=e^x$ √ v and u value

$\frac{dy}{dx}=3x^3\times e^x+e^x\times 9x^2$ √ Multiplication

$=3x^3e^x+9x^2e^x$ √ Simplify

$=3x^2e^x(x+3)$ ✓ Final answer (3)

2.2.3

$f(x)=In(4x-5)$

$Let\ u=4x-5$

$\frac{du}{dx}=4$

$y=Inu$ √ Multiplication

$\frac{dy}{du}=\frac{1}{u}$

$\frac{dy}{dx}=\frac{du}{dx}\times\frac{dy}{du}$

$=4\times\frac{1}{(4x-5)}$ √ Substitution

$=\frac{4}{(4x-5)}$ ✓ Final answer (2)

2.2.4

$$f(x)=\frac{x^2-3x}{x^3+1}$$

$$f'(x)=\frac{(x^3+1)(2x-3)-(x^2-3x)3x^2}{(x^3+1)^2}$$

$$=\frac{2x^4-3x^3+2x-3-3x^4+9x^3}{(x^3+1)^2}$$

$$=\frac{-x^4+6x^3+2x-3}{(x^3+1)^2}$$

(3)

2.3 2.3.1

$$S=t^3+3t^2+3$$

$$\frac{dS}{dt}=3t^2+6t$$ ✓ Differentiation

$$=3\left(\frac{3}{2}\right)^2+6(\frac{3}{2})$$ ✓ Substitution

$$=\frac{27}{4}+\frac{18}{2}$$ Final answer

$$=\frac{63}{4}$$

$15{,}75\ m/s$ ✓ (3)

2.3.2

$$\frac{dS}{dt}\ 3(3)^2+6(3)$$ ✓ Substitution

$$=27+18$$

$$=45\ m/s$$ ✓ Final answer (2)

2.3.3

$$24=6t+3t^2$$ √ Transpose

$$3t^2+6t-24=0$$

$$3(t^2+2t-8)=0$$ √ Common factor

$$(t+4)(t-2)=0$$

$$t=-4s\ \ and\ \ t=2s$$ ✓ ✓ Substitution both equation
Both answer (3)

[25]

QUESTION 3

3.1 3.1.1

$$\int (2x-3)(1-2x)dx$$

$$\int (-4x^2+6x+2x-3)dx$$

$$\int (-4x^2+8x-3)dx \quad \checkmark$$

$$=[\frac{-4x^{2+1}}{2+1}+\frac{8x^{1+1}}{1+1}-3x+c] \quad \checkmark$$

$$=\frac{-4x^3}{3}+4x^2-3x+c \quad \checkmark \qquad (3)$$

3.1.2

$$\int (\frac{2}{x^2}-2\sqrt{x}+\frac{3}{e^{-x}})dx$$

$$\int (2x^{-2}-2x^{\frac{1}{2}}+3e^x)dx$$

$$=\frac{2x^{-2+1}}{-2+1}-\frac{2x^{\frac{1}{2}+1}}{\frac{1}{2}+1}+3e^x+c \quad \checkmark$$

$$=\frac{-2}{x}-\frac{4}{3}x^{\frac{3}{2}}+3e^x+c \quad \checkmark$$

$$=\frac{-2}{x}-\frac{4}{3}\sqrt{x^3}+3e^x+c \quad \checkmark \qquad (3)$$

3.1.3

$$\int (3e^{2x}-\frac{4}{x})dx \quad \checkmark$$

$$\int (3e^{2x}-4x^{-1})dx$$

$$=\frac{3}{2}e^{2x}-4In\ x+c \quad \checkmark \checkmark \qquad (3)$$

3.2

$$\int_1^3 \left[\left(\frac{1}{3}x^3 - 2x^2 + 3\right) \right]$$

$$= \left[\frac{x^4}{12} - \frac{2}{3}x^3 + 3x \right]_1^3 \quad ✓$$

$$= \left[\frac{(3)^4}{12} - \frac{2}{3}(3)^3 + 3(3) \right] - \left[\frac{(1)^4}{12} - \frac{2}{3}(1)^3 + 3(1) \right] \quad ✓$$

$$= \left(\frac{27}{4}\right) - 18 + 9) - \left(\frac{1}{12} - \frac{2}{3} + 3\right) \quad ✓$$

$$= -\frac{9}{4} - \frac{29}{12}$$

$$= -\frac{14}{3} \; or \; -4{,}667 \quad ✓$$

(4)

3.3

$$y = -\frac{1}{2}x^3 \quad ✓$$

$$Area = \int_{-2}^{0} \left(-\frac{1}{2}x^3\right) dx - \int_{0}^{2} \left(-\frac{1}{2}x^3\right) dx$$

$$= \left[-\frac{1}{8}x^4 \right]_{-2}^{0} - \left[-\frac{1}{8}x^4 \right]_{0}^{2} \quad ✓ \quad ✓$$

$$= \left[-\frac{1}{8}(0)^4 - \left(-\frac{1}{8}(-2)^4 \right) \right] - \left[-\frac{1}{8}(2)^4 - \left(-\frac{1}{8}(0)^4 \right) \right]$$

$$= \left[\frac{16}{8} \right] - \left[-\frac{16}{8} \right]$$

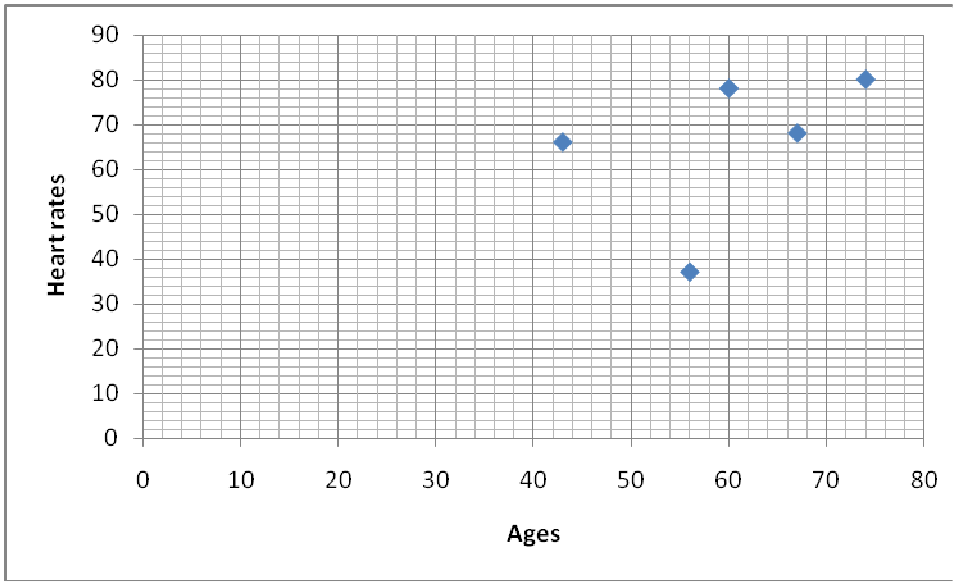
$$= 2 + 2 \quad ✓$$

$$= 4 \; square \; units \quad ✓$$

(5)
[18]

QUESTION 4

4.1 4.1.1



✓ ✓ ✓ ✓ ✓

(5)

4.1.2

Ages (x)	Heart rate/minutes (y)	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})(y-\bar{y})$	$(x-\bar{x})^2$
60	78	-7,4	16,9	-125,06	54,76
74	80	6,6	18,9	124,74	43,56
67	68	-0,4	6,9	121,98	0,16
43	66	-24,4	4,9	119,56	595,36
56	37	-11,4	-24,1	286,92	129,96
300	**60**			**289,02**	**823,8**
$\bar{x}=60$ ✓	$\bar{y}=65,9$ ✓				

✓

$$b=\frac{\sum(x-\bar{x})(y-\bar{y})}{\sum(x-\bar{x})^2}$$

$$=\frac{326}{550}$$ ✓

$$=0,593$$ ✓

$$a=\bar{y}-b\bar{x}$$

$$=65,9-(0,593)(60)$$ ✓

$$=30,32$$

$$\hat{y}=30,32+0,593x$$ ✓

(7)

4.1.3 $\hat{y} = 30{,}32 + 0{,}593x$

$= 30{,}32 + 0{,}593\ (68)$

$= 70{,}644$ ✓ (1)

ALTERNATIVE METHOD

4.1.4

Ages (x)	Heart rate(y)	xy	x^2
60	78	4680	3600
74	80	5920	5476
67	68	4556	4489
43	66	2838	1849
56	37	2072	3136
300	**329**	**20066**	**18550**
$\bar{x} = 60$	$\bar{y} = 65{,}9$		

$$b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$$

$$= \frac{5(20066) - (300)(329)}{5(18550) - (300)^2}$$

$= 0{,}593$

$a = \bar{y} - b\bar{x}$

$a = 65{,}9 - 0{,}593(60)$

$a = 30{,}32$

$\hat{y} = 30{,}32 + 0{,}593x$ (7)

4.1.5 $\hat{y} = 30{,}32 + 0{,}593x$

$= 30{,}32 + 0{,}593\ (68)$

$= 70{,}644$ ✓ (1)

4.2 n = 5

$$mean = \frac{8+2+10+14+16}{5}$$

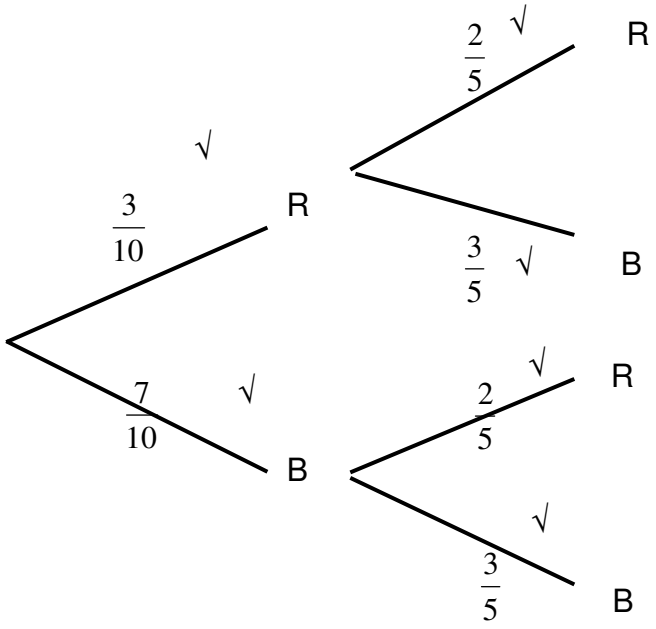
$$= 10 \quad ✓$$

x	$x-\bar{x}$	$(x-\bar{x})^2$
8	-2	4
2	-8	64
10	0	0
14	4	16
16	6	36
✓	✓	**Error! Objects cannot be created from editing field codes.** ✓

$$SD = \sqrt{\frac{120}{5-1}} \quad ✓$$

$$= \sqrt{30} \ \ or\ 5{,}478 \quad ✓$$ (6)

4.3



(7)

4.4 4.4.1 $P(red\ \ flower) = P(RB) = \frac{9}{50}$ ✓ (2)

4.4.2 $P(different\ colour) = P(RB\ or\ BR)$

$= P(RB) + P(BR)$

$= \frac{9}{50} + \frac{14}{50}$ ✓ ✓

$= \frac{23}{50}$ ✓ (3)

4.4.3 $P(blue\ \ flower\ \ from\ the\ \ \text{sec}\, bag) = P(RB\ or\ \mathbf{B}B)$ ✓

$= \frac{9}{50} + \frac{21}{50}$ ✓

$= \frac{3}{5}$ ✓ (3)

[34]

TOTAL: 100