higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

NOVEMBER EXAMINATION

MATHEMATICS
(First Paper)
NQF LEVEL 2

28 October 2013

This marking guideline consists of 13 pages.

QUESTION 1

✓= 1 MARK √ $= \frac{1}{2}$ MARK

1.1 1.1.1

$x = 0{,}1222.....(1)$ √
$100x = 12{,}22.....(2)$ √
$10x = 1{,}22.....(3)$ √
eq (2) - eq (3)
$90x = 11$ √
$\therefore x = \frac{11}{90}$ ✓

Answer only: only 1 mark out of 3

(3)

1.1.2 $x = 3{,}54$

$x = \frac{354}{100}$ √
$= \frac{177}{50}$ √

Answer only: full mark; No marks for mixed fraction.

(1)

1.2 1.2.1

$\sqrt[4]{x^{-2}y^{-4}}$
$= \left(x^{-2}y^{-4}\right)^{\frac{1}{4}}$
✓ $= x^{\frac{-1}{2}}y^{-1}$ ✓
$= \frac{1}{\sqrt{x}y}$ √
√

Accept $x^{-\frac{2}{4}}y^{-\frac{4}{4}}$

(3)

1.2.2 $\frac{15^{n+1} \times 75^{-n}}{25^{1-n} \times 3}$
$= \frac{(3\times5)^{n+1} \times (3\times5\times5)^{-n}}{(5\times5)^{1-n} \times 3}$
$\frac{3^{n+1}.5^{n+1} \times 3^{-n}.5^{-n}.5^{-n}}{5^{1-n}.5^{1-n} \times 3}$

Half mark for writing each term as prime factors (√√√)

Half mark each for applying correct exponential rule (√√√)

$= 3^{n+1-n-1} \times 5^{n+1-n-n-1+n-1+n}$
√
$= 3^0 \times 5^{n-1}$ (for recognising $3^0 = 1$)
$= 5^{n-1}$ √

(4)

1.2.3 $\dfrac{\sqrt{75}+\sqrt{3}+\sqrt{12}}{\sqrt{27}}$

$=\dfrac{\sqrt{25\times3}+\sqrt{3}+\sqrt{4\times3}}{\sqrt{9\times3}}$

$=\dfrac{5\sqrt{3}+\sqrt{3}+2\sqrt{3}}{3\sqrt{3}}$ √ √ √

$=\dfrac{8\sqrt{3}}{3\sqrt{3}}$ √

$=\dfrac{8}{3}$ ✓

1 mark for answer only.
If correct decimal answer then 1 mark only.

(3)

1.3 $\dfrac{4\sqrt{7}}{3\sqrt{5}}\times\dfrac{3\sqrt{5}}{3\sqrt{5}}$ ✓ or $\dfrac{4\sqrt{7}}{3\sqrt{5}}\times\dfrac{\sqrt{5}}{\sqrt{5}}$ ✓

$=\dfrac{12\sqrt{35}}{9\sqrt{25}}$ $=\dfrac{4\sqrt{35}}{3\cdot5}$ ✓

$=\dfrac{12\sqrt{35}}{45}$ ✓ ✓ $=\dfrac{4\sqrt{35}}{15}$ ✓

$=\dfrac{4\sqrt{35}}{15}$

Answer only: 1 mark

Answer only: 1 mark

(3)

1.4 1.4.1 $R=\sqrt{\dfrac{3h}{2}}$

$R^2=\left(\sqrt{\dfrac{3h}{2}}\right)^2$

$R^2=\dfrac{3h}{2}$ ✓

$3h=2R^2$ ✓

$\therefore h=\dfrac{2R^2}{3}$ ✓

(3)

1.4.2 $h = \frac{2R^2}{3}$

if R = 9

$h = \frac{2(9)^2}{3}$

$\therefore h = 54$ ✓ c/f mistake from 1.4.1 (1)

1.5 1.5.1 $T_n = a + (n-1)d$

√ √

$T_{11} = 5 + (11-1)(-8)$

$= 5 - 80$

$= -75$ ✓

Answer only: Full marks (2)

1.5.2 $S_n = \frac{n}{2}[2a + (n-1)d]$

$S_9 = \frac{9}{2}[10 + (9-1)(-8)]$

✓✓ 1 mark subst.; 1 mark correct formula.
c/f incorrect a and d used in 1.5.1

$= \frac{9}{2}[10 - 64]$

$= \frac{9}{2}[-54]$

$= 243$ ✓

Answer only: 3 full marks (3)

1.6 $24 = a + 9d$.....(1) ✓

$96 = a + 21d$.....(2) ✓

eq(2) – eq(1)

$72 = 12d$

$\therefore d = 6$ √

$sub: d = 6$ into (1)

$24 = a + 9(6)$ ✓ for substitution

$24 = a + 9(6)$

$\therefore a = -30$ √

$\therefore$ *therefore the first three terms are* $\{-30; -24; -18\}$ ✓

Must give ALL three terms to get the final 1 mark. Carry forward incorrect 'a' and 'd'. Answer only: 5 full marks. (5)

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QUESTION 2

2.1 2.1.1 Hyperbola✓

Do not mark down for spelling.

(1)

2.1.2 2^{nd} ✓and 4^{th}✓ quadrants

(2)

2.1.3 No✓

(1)

2.1.4 Domain : $\{x/x \neq 0; (-\infty;\infty)\}$ or $\{x/x \in R \text{ but } x \neq 0\}$ ✓

Half mark if student only writes $x \neq 0$

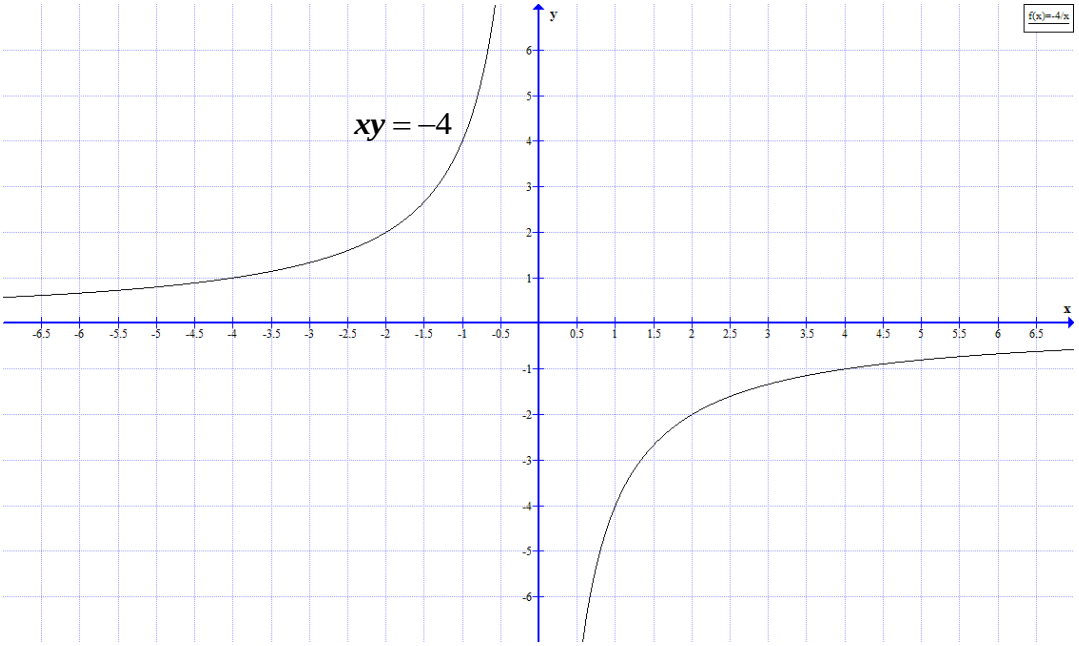
(1)

2.1.5 Range : $\{y/y \neq 0; (-\infty;\infty)\}$ or $\{y/y \in R \text{ but } y \neq 0\}$✓

Half mark if student only writes $y \neq 0$

(1)

2.1.6



1 mark for each curve in the correct quadrant. ✓✓

1 mark for correct shape in both quadrants. ✓

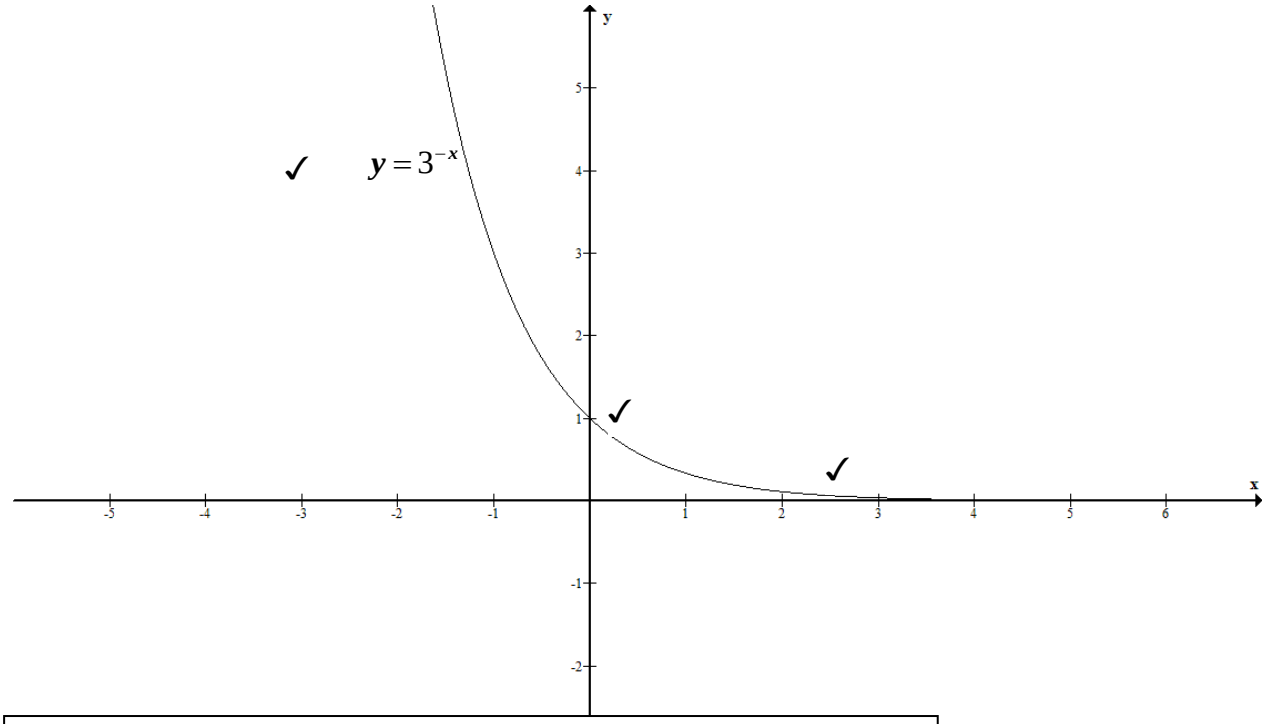
(3)

2.2

x	-2	-1	0	1	2
y	(i) =9√	(ii) =3√	1	(iii) = $\frac{1}{3}$ √	(iv) = $\frac{1}{9}$ √

(2)

2.3 2.3.1



1 mark for correct plotting from table (C/f errors from table in Q2.2)
1 mark for y-intercept.
1 mark for the shape of the graph.(not touching x-axis)

(3)

2.3.2 y- intercept = 1✓

If student gives '1' or (0 ; 1): Full mark

(1)

2.3.3 yes✓

(1)

2.4 2.4.1 From graph it can be seen it is the graph of $y = ab^x + q$, or, $y = b^x + q$ √ and $q = 1$,

Given pt (1;3) which lies on $y = ab^x + q$

√ √ √

$3 = (a)b^1 + 1 \ldots\ldots\ldots(1)$

$2 = ab^0 + 1 \ldots\ldots\ldots\ldots(2)$ using pt (0;2)

$a = 1$ and by substituting in (1)

$3 = (1)b^0 + 1$

$b = 2$ √

$\therefore y = 2^x + 1$ √

Alternative working:
Given (1 ; 3) which lies on the graph of $y = b^x + q$,

√ √ √

$3 = b^1 + 1$

$2 = b^1$ √

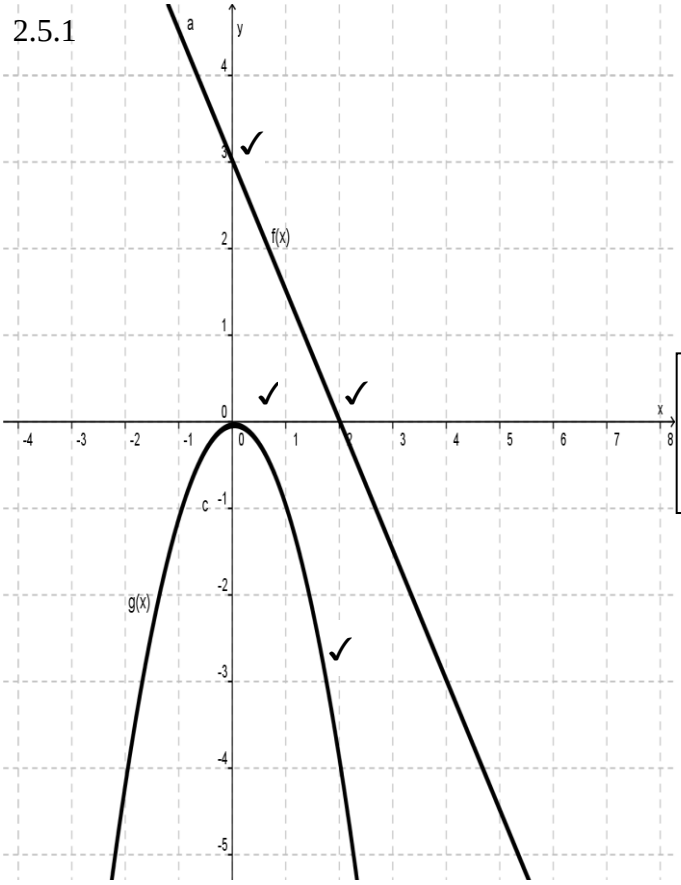
$b = 2$

$\therefore y = 2^x + 1$ √

(3)

2.4.2 Exponential graph✓ Do not mark down for spelling (1)

2.5 2.5.1



Deleted 1 mark at the TP of the parabola, which was incorrectly inserted.

2 marks for the graph of f(x) Straight line.(✓for y-int and ✓for x-int)
2 marks for the graph of g(x) Parabola.(✓for TP and ✓ for shape)

(4)

2.5.2 Straight line graph. ✓ (1)

2.5.3 Continuous. ✓ Do not accept answer of 'yes' or 'no'. (1)

[26]

QUESTION 3

3.1 3.1.1 $y-2+4x-2xy$

$(\boldsymbol{y}-2\boldsymbol{xy})+(-2+4\boldsymbol{x})$

$\sqrt{}\ \sqrt{}\ \sqrt{}\ \sqrt{}$
$y(1-2x)-2(1-2x)$

$\sqrt{}\ \sqrt{}$
$(y-2)(1-2x)$

Alternative method

$(y-2)+(4x-2xy)$

$\sqrt{}\ \sqrt{}$
$(y-2)+2x(2-y)$

$\sqrt{}\ \sqrt{}\ \sqrt{}$
$(y-2)-2x(y-2)$

$\sqrt{}$
$(1-2x)(y-2)$ (3)

3.1.2 $12y^3+14y^2-40y$

$\sqrt{}\ \sqrt{}$
$2y(6y^2+7y-20)$

$2y(3y-4)(2y+5)$ ✓ ✓

Subtract half mark if '$2y$' absent in final answer. (3)

3.1.3 $4x^2-9$

$2^2x^2-3^2$

$(2x+3)(2x-3)$ ✓ ✓ (2)

3.2 3.2.1 $3xy-3x-2yx+6xy-xy+2x$

$6xy-x$ ✓ ✓ (2)

3.2.2 $(1-x)(x^2-x-2)$

$x^2-x-2-x^3+x^2+2x$ ✓ ✓

$-x^3+2x^2+x-2$ ✓ (for collecting like terms)

Subtract half mark for each incorrect term in final answer, i.e., 2 errors gets zero marks. (3)

3.3 $9^{3x+2} = 81^{x+2}$

√ √

$3^{6x+4} = 3^{4x+8}$ or $9^{3x+2} = 9^{2(x+2)}$ ✓

$6x + 4 = 4x + 8$✓ $9^{3x+2} = 9^{2x+4}$

$2x = 4$ $3x + 2 = 2x + 4$✓

$\therefore x = 2$✓ $x = 2$✓ (3)

3.3 3.4.1 $-6 < 2 + 4x \leq 18$

√ √

$-8 < 4x \leq 16$

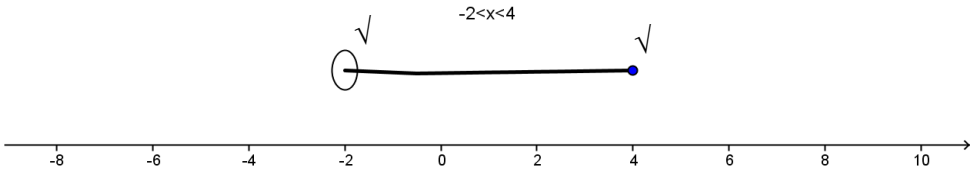
√ √

$-2 < x \leq 4$ (2)

3.4.2 Interval notation √ √ (-2;4] (1)

Half mark each for the correct value

3.4.3 Number line:



(1)

3.5 $x+y=4$ ……...(1) and $xy=4$ ……..(2)

From eq.(1) $y=4-x$ ✓ or $x=4-y$ ✓

Substitute: $y=4-x$ into eq.(2) sub $x=4-y$ into eq (2)

$x(4-x)=4$ $(4-y)y=4$

$x^2-4x+4=0$ ✓ $y^2-4y+4=0$ ✓

$(x-2)(x-2)=0$ $(y-2)(y-2)=0$

$\therefore x=2$ ✓ $\therefore y=2$ ✓

$y=2$ ✓ $x=2$ ✓

Alternative method

$x+y=4$ ……...(1)
$xy=4$ ……(2)

from (2) $y=\frac{4}{x}$ (3) ✓ or *from* (2) $x=\frac{4}{y}$ (3) ✓

Sub: (3) into (1) Sub: (3) into (1)

$x+\frac{4}{x}=4$ $\frac{4}{y}+y=4$

$x^2-4x+4=0$ ✓ $y^2-4y+4=0$ ✓

$(x-2)(x-2)=0$ $(y-2)(y-2)=0$

$x=2$ ✓ $y=2$ ✓

Sub: $x=2$ in (2) Sub: $y=2$ in (2)

$\therefore y=2$ ✓ $\therefore x=2$ ✓ (4)

[24]

QUESTION 4 [For Q4.1: accept any reasonable explanation]

4.1 4.1.1 Principal amount – This is the initial amount of money that is either borrowed from an institution/person or lent to an institution/person. ✓ (1)

4.1.2 Variance – The difference between the budgeted amount and the actual amount. ✓ (1)

4.1.3 Fixed expense – Expenses that do not change from month to month. e.g. home loan✓ (1)

4.1.4 Income – Money earned from working. e.g. salary✓ (1)

4.1.5 Short term investment – This would normally be an investment the duration of which is usually anywhere between 1 to 5 years. ✓ (1)

4.2 4.2.1 Balance = R1799 –R250 = R1549

$A = P(1+\frac{r}{100}n)$ √

$= 1549(1+\frac{15}{100}\times 2)$ √

Half mark for P even if compound formula is used

$= R2013{,}70$ ✓

$Instalment = R2013{,}70 \div 24$

$= R83{,}90$ ✓

Carry forward error from previous (3)

4.2.2 Hire purchase = R2013,70+R250
= R2263,70✓

C/f error from 4.2.1

Extra cost = R2263,70–R1799
= R464,70✓

Answer only: Full marks

Alternate method

(HP cost) – (Cash price) = Extra cost

(2013.70) – (15649.00) = R464.70 ✓✓ (2)

4.3

INCOME AND EXPENDITURE: RECORD OF ALL EARNINGS FOR PRETTY.	
INCOME	**AMOUNT**
Pocket money √	R75,00 √
Part-time work at the supermarket√	R400,00√
Total income	**R475,00**√
EXPENDITURE	**AMOUNT**
Prepaid airtime√	R110,00√
Shampoo√	R28,00√
Deodorant√	R15,00√
Sweets and movies√	R100,00√
Donation at the church√	R40,00√
Total expenditure	**R293,00**√
SURPLUS	**R182,00✓**

(9)
[19]

4.3

INCOME AND EXPENDITURE: RECORD OF ALL EARNINGS FOR PRETTY.	
INCOME	AMOUNT
Pocket money √	R75,00 √
Part-time work at the supermarket√	R400,00√
Donation at the church√	R40,00√
Total income	R515,00√
EXPENDITURE	AMOUNT
Prepaid airtime√	R110,00√
Shampoo√	R28,00√
Deodorant√	R15,00√
Sweets and movies√	R100,00√
Total expenditure	R253,00√
SURPLUS	R262,00✓

(9)
[19]

TOTAL: 100