JHB EAST

MATHEMATICS

2026 TERM 1

CONTROLLED TEST

MARKING GUIDELINES

GRADE 12

MARKS: 50

This marking guideline consists of 11 pages including the cover page.

NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed-out version.
- Consistent accuracy applies in ALL aspects of the marking guidelines. Stop marking at the second calculation error.
- Assuming answers/values to solve a problem is NOT acceptable**.**

QUESTION 1

1.1	Solve for x:		
1.1.1	$2x^2 + x - 3 = 0$ $(2x+3)(x-1) = 0$ $x = -\frac{3}{2}$ or $x = 1$	✓ Factors ✓ Both x values	(2)
1.1.2	$\sqrt{3x+1} - x = -1$ $(\sqrt{3x+1})^2 = (x-1)^2$ $3x + 1 = x^2 - 2x + 1$ $x^2 - 5x = 0$ $x(x-5) = 0$ $x \neq 0 \quad x = 5$	✓ Squaring both sides ✓ Standard form ✓ Factors ✓ $x \neq 0$ ✓ 5	(5)
1.1.3	$(2-x)(x+5) > 0$ $(x-2)(x+5) < 0$ $CV: -5; 2$ $-5 < x < 2$	✓ $(x-2)(x+5) < 0$ ✓ Correct critical values ✓ Correct notation	(3)
1.2	$k^2 - 1 > 0$ $(k+1)(k-1) > 0$ $CV: -1; 1$ $k < -1$ or $k > 1$	✓Correct inequality sign ✓ Factors ✓Solution	(3)
			[13]

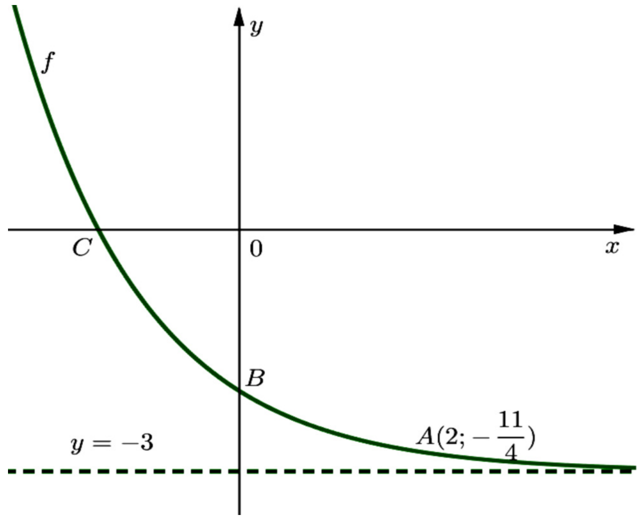
QUESTION 2

2.1			
2.1.1	1st differences: $-8\,;\ -14;\ -20\,;\ ..$ Common 2nd difference: -6 $2a=-6$ $a=-3$ $3(-3)+b=-8$ $b=1$	✓ Common 2nd difference ✓ $2a=-6$ ✓ $3(-3)+b=-8$	(3)
2.1.2	$-3n^2+n-2=-19122$ $3n^2-n-19120=0$ $(3n+239)(n-80)=0$ $n=80 \qquad n\neq-\frac{239}{3}$ Yes. -19122 is the 80th term in the sequence.	✓ $T_n=-19122$ ✓ Standard form ✓ Factors ✓ Conclusion	(4)
2.2	Consider the series: $3+9+15+\cdots+273$		
2.2.1	$a=3, d=6$ and $T_n=273$ $T_n=a+(n-1)\,d$ $273=3+(n-1)\,(6)$ $3+6n-6=273$ $6n=276$ $n=46$	✓$d=6$ ✓Correct subst. ✓ $n=46$	

	$\therefore$ There are 46 terms in the series.		(3)
2.2.2	Determine the sum of the terms in the series. $S_n = \frac{n}{2}(2a + (n-1)d)$ $S_{46} = \frac{46}{2}(2(3) + (46-1)(6)) =$	✓ Correct subst. ✓ Answer	(2)
2.3	$r = 3 \quad a = 1 \quad T_n = t$ $T_n = ar^{n-1}$ $T_n = (1)(3)^{n-1}$ $T_n = (3)^{n-1} \quad but \quad T_n = t$ $\therefore 3^n = 3t$ $S_n = \frac{a(r^n - 1)}{r - 1}$ $S_n = \frac{1(3^n - 1)}{3 - 1}$ $S_n = \frac{3t - 1)}{2}$	✓subst. ✓$3^n = 3t$ ✓subst. into the correct formula ✓ answer	(4)
2.4.1	$S_\infty = \frac{a}{1 - r}$ $\therefore S_\infty = \frac{30}{1 - \frac{4}{5}}$ $\therefore S_\infty = 150$ $\therefore$ Maximum amount of gold is 150 kg.	✓value of a and r ✓subst. ✓answer	(3)

2.5	$\sum_{k=3}^{m} 8(2)^{k-1} = 131\ 040$ $32 + 64 + 128 + \cdots$ $r = 2$ $S_n = \frac{a(1-r^n)}{1-r}$ $131\ 040 = \frac{32(1-2^n)}{1-2}$ $2^n - 1 = 4095$ $2^n = 4096$ $2^n = 2^{12}$ OR $n = \log_2 4096$ $n = 12$ $n = m - 3 + 1$ $m = 14$	✓value of a and r ✓substitution ✓simplification ✓Value of n. ✓answer	(5)
			[24]

QUESTION 3

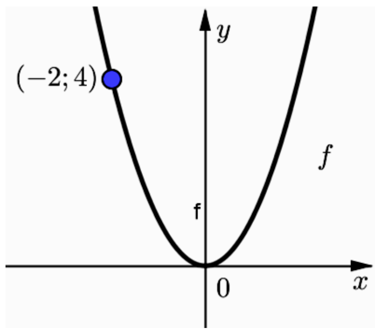


3.1	$f(x) = a^x + q$ $-\frac{11}{4} = a^2 - 3$ $\frac{1}{4} = a^2$ $a = \frac{1}{2}$	✓ Correct substitution ✓ Answer	(2)
3.2.1	$f(x) = \left(\frac{1}{2}\right)^x - 3$ $y = \left(\frac{1}{2}\right)^0 - 3 = -2$ $B(0; -2)$	✓ $x = 0$ ✓ $B(0\,;\,-2)$	(2)

3.2.2	C $0 = (\frac{1}{2})^x - 3$ $(\frac{1}{2})^x = 3$ $x = log_{\frac{1}{2}}3 = -1.58$ $C(0; -1.58)$	✓ $y = 0$ ✓$C(0; -1.58)$	(2)
3.3	$f(x) = (\frac{1}{2})^x - 3$ $x = (\frac{1}{2})^y - 3$ $y = log_{\frac{1}{2}}(x + 3)$ / $y = -log_2(x + 3)$	✓ Interchanging x and y. ✓ Answer	(2)
3.4	Reflection about the x −axis and translated 6 units to the right.	✓ reflection about the $x - axis$. ✓translated 6 units to the right	(2)
3.5.1	$x > -3$ OR $x \in (-3; \infty)$	✓ $x > -3$	(1)
3.5.2	Read it off from the graph. OR $-log_2(x + 3) > 2$ $log_2(x + 3) < -2$	✓ $x < -\frac{11}{4}$	

	$x+3<2^{-2}$ $x<-\frac{11}{4}$		(1)
			[12]

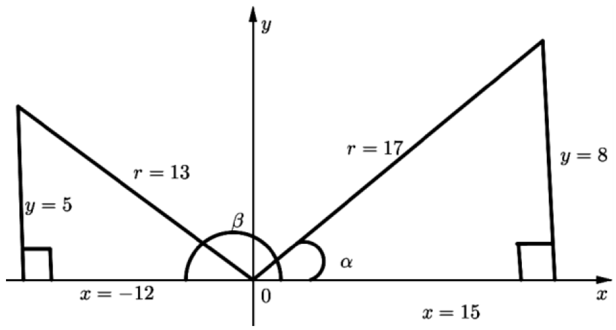
QUESTION 4



4.1	$x \leq 0 \ \ or\ x \geq 0$	✓Answer Accept: $x<0 \ \ or\ x>0$ Accept one: $i.e. x \leq 0\ /\ x \geq 0$	(1)
4.2	$f(x)=ax^2$ $4=a(-2)^2$ $a=1$ $x=y^2$ $y=\pm\sqrt{x} \quad but\ x \geq 0$	✓Correct substitution ✓ $y=\pm\sqrt{x}$ ✓$x \geq 0$	(3)
4.3	$g(x)=(x+1)^2-3$ $y-intercept: (0;-2)$ $g(x)=-k$ $-3<-k<-2$	✓ $y-intercept$ ✓$g(x)=-k$ ✓ $-3<-k<-2$	

	$2 < k < 3$	✓ $2 < k < 3$	(4)
			[8]

QUESTION 5

5.1			
5.1.1	$sin(-\beta)$  $sin(-\beta)$ $= -sin\beta$ $= -\frac{5}{13}$	✓ $-sin\beta$ ✓ Answer	(2)
5.1.2	$cos(\beta + \alpha)$ $= cos\beta cos\alpha - sin\beta sin\alpha$ $= (-\frac{12}{13})(\frac{15}{17}) - (\frac{5}{13})(\frac{8}{17})$ $= -\frac{220}{221}$	✓ Expansion ✓ Substitution ✓ Answer	(3)
5.2	$Given: \frac{2cos(90^o - x).cos(180^o + x)}{sin^2(90^o + x) + sin(-x), sin(180^o - x)} = -tanx$		
5.2.1	Simplify the above expression to a single trigonometric ratio. $\frac{2sinx.-cosx}{(cosx)^2 + (-sinx)(sinx)}$ $= \frac{-2sinxcosx}{cos^2x - sin^2x}$ $= \frac{-sin2x}{cos2x}$ $= -tan2x$	✓ $sinx$ ✓ $-cosx$ ✓ $cosx$ ✓ $sinx$ ✓ $sin2x$ ✓ $cos2x$ ✓ $-tan2x$	(7)

5.2.2	Hence or otherwise, determine the general solution if: $$\frac{2cos(90^o - x).cos(180^o + x)}{sin^2(90^o + x) + sin(-x), sin(180^o - x)} = \frac{1}{2}$$ $-tan2x = \frac{1}{2}$ $tan2x = -\frac{1}{2}$ $2x = -26.57^o + k.180^o \quad k \in Z$ $x = -13.28^o + k.90^o$	✓$tan2x = -\frac{1}{2}$ ✓$2x = -26.57^o + k.180^o$ ✓$x = -13.28^o + k.90^o$	(3)
5.3	Prove that $cos25^o - cos35^o = sin5^o$ $cos(30^o - 5^o) - cos(30^o + 5^o)$ $= cos30^o cos5^o + sin30^o sin5^o - (cos30^o cos5^o - sin30^o sin5^o)$ $= 2sin30^o sin5^o$ $= 2 \times \frac{1}{2} sin5^o$ $= sin5^o$	✓1st expansion ✓ 2nd expansion ✓$2 \times \frac{1}{2} sin5^o$	(3)
			[18]
		Total = 75 marks	