KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL

SENIOR CERTIFICATE

GRADE 12

MATHEMATICS

GRADE 12 SBA TASK

TERM 2 ASSIGNMENT 2025

MARKS: 50

TIME: 1,5 hours

N.B. This question paper consists of 5 pages and an information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 4 questions.

2. Answer **ALL** questions.

3. Clearly show **ALL** calculations, diagrams, graphs, etc. which you have used in determining your answers.

4. Answers only will not necessarily be awarded full marks.

5. You may use an approved scientific calculator (non-programmable and non-graphical) unless stated otherwise.

6. If necessary, round of answers correct to TWO decimal places, unless stated otherwise.

7. Diagrams are not necessarily drawn to scale.

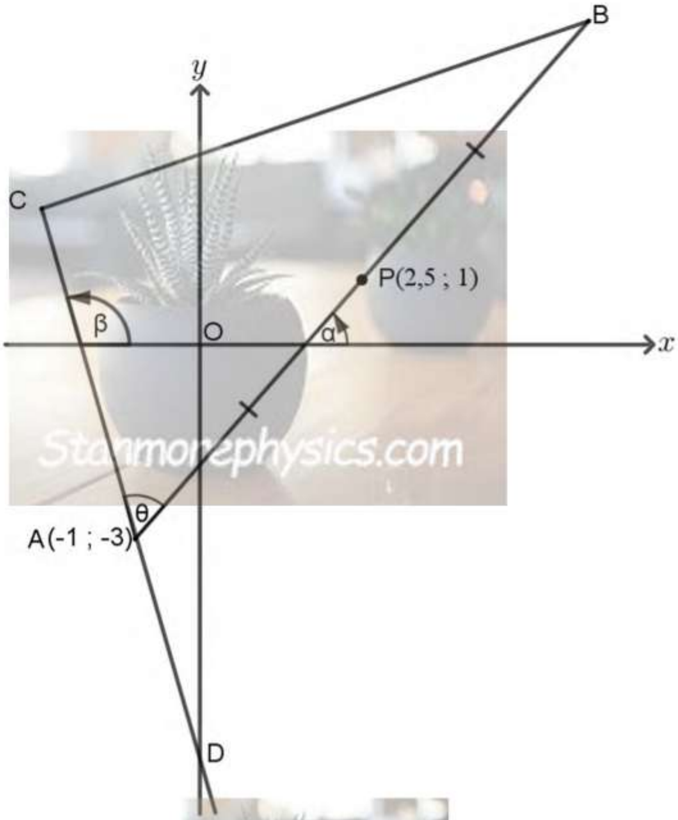
8. Number the answers correctly according to the numbering system used in this question paper.

9. An information sheet with formulae is included at the end of the question paper.

10. Write neatly and legibly.

QUESTION 1

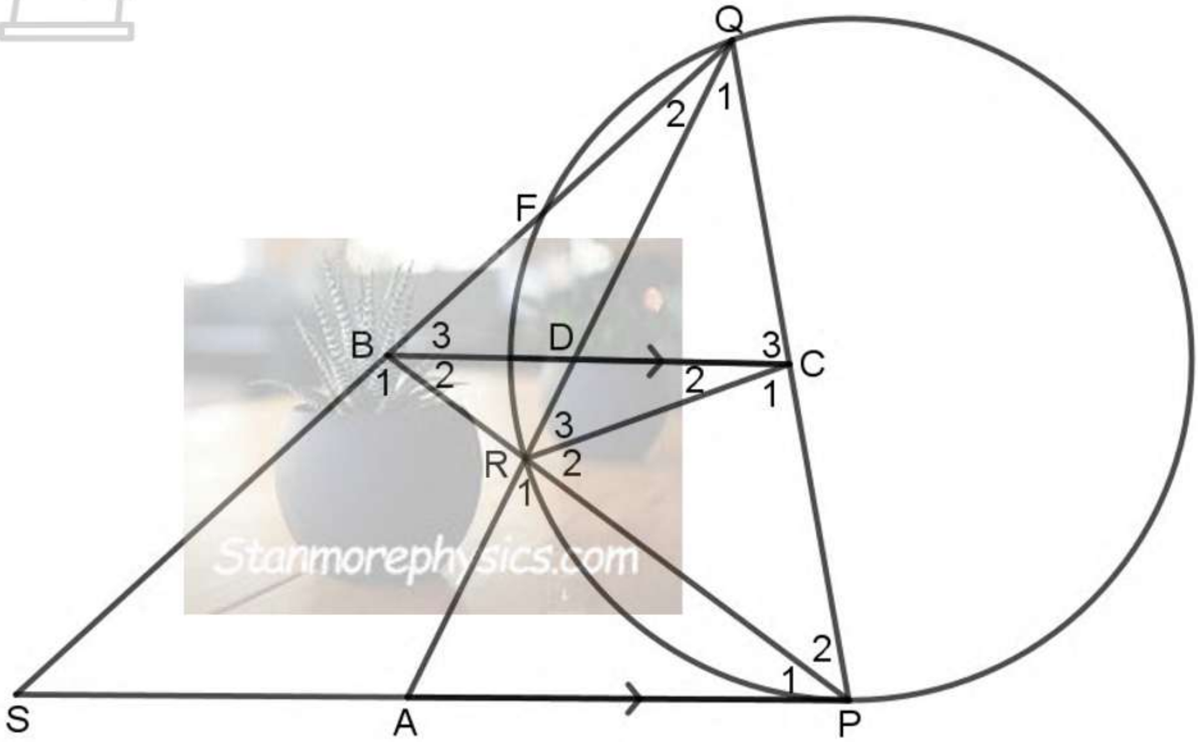
In the diagram below, $A(-1;-3)$, B and C are the vertices of a triangle. $P(2,5;1)$ is the midpoint of AB. CA extended cuts the $y-axis$ at D. The equation of CD is $y=-3x+k$. $C\hat{A}B=\theta$. α and β are the angles that AB and AC make with the $x-axis$.



1.1	Determine the value of k	(2)
1.2	Determine the coordinates of B.	(2)
1.3	Determine the gradient of AB.	(2)
1.4	Calculate the size of θ.	(5)
		[11]

QUESTION 2

In the diagram below, SP is a tangent to the circle at P and PQ is a chord. Chord QF produced meets SP at S and chord RP **bisects** $Q\hat{P}S$. PR produced meets QS at B. $BC \parallel SP$ and cuts the chord QR at D. QR produced meets SP at A. Let $\hat{B}_2 = x$.



2.1 Name, with reasons, 3 angles equal to x. (6)

2.2 Prove that $PC = BC$. (2)

2.3 Prove that $RCQB$ is a cyclic quadrilateral. (2)

2.4 Prove that $\Delta PBS \parallel\!\mid \Delta QCR$. (5)

2.5 Show that $PB.CR = QB.CP$. (4)

[19]

QUESTION 3

3.1 Determine $f'(x)$ from first principles if $f(x) = -3x^2 + 1$. (5)

3.2 Determine:

3.2.1 $f'(x)$ if $f(x) = \frac{2}{3}x^3 - 2x$ (2)

3.2.2 $D_x\left[\sqrt[5]{x} + \frac{7}{x}\right]$ (3)

[10]

QUESTION 4

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

4.1 Determine the values of x if $f(x) = 0$. (3)

4.2 Determine the coordinates of the turning points of f. (3)

4.3 Draw a sketch graph of f. Clearly label all the intercepts with the axes and any turning points. (3)

4.4 Use the graph to determine the **positive** value(s) of k for which $f(x) - k = 0$ will have ONE real root. (1)

[10]

TOTAL: 50

INFORMATION SHEET

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$A = P(1 + ni)$ $\quad$ $A = P(1 - ni)$ $\quad$ $A = P(1 - i)^n$ $\quad$ $A = P(1 + i)^n$

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

$T_n = ar^{n-1}$ $\quad$ $S_n = \frac{a(r^n - 1)}{r - 1}; r \neq 1$ $\quad$ $S_\infty = \frac{a}{1 - r}; -1 < r < 1$

$F = \frac{x[(i + 1)^n - 1]}{i}$ $\quad$ $P = \frac{x[1 - (1 + i)^{-n}]}{i}$

$$f'(x) = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h}$$

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $\quad$ $M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$

$y = mx + c$ $\quad$ $y - y_1 = m(x - x_1)$ $\quad$ $m = \frac{y_2 - y_1}{x_2 - x_1}$ $\quad$ $m = \tan\theta$

$$(x - a)^2 + (y - b)^2 = r^2$$

$In\ \Delta ABC$: $\quad$ $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

$$a^2 = b^2 + c^2 - 2bc.\cos A$$

$$area\ \Delta ABC = \frac{1}{2}ab.\sin C$$

$\sin(\alpha + \beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$ $\quad$ $\sin(\alpha - \beta) = \sin\alpha\cos\beta - \cos\alpha\sin\beta$

$\cos(\alpha + \beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$ $\quad$ $\cos(\alpha - \beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$

$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases}$ $\quad$ $\sin 2\alpha = 2\sin\alpha.\cos\alpha$

$\overline{x} = \frac{\sum x}{n}$ $\quad$ $\sigma^2 = \sum_{i=1}^{n} \frac{(x_i - \overline{x})^2}{n}$

$P(A) = \frac{n(A)}{n(S)}$ $\quad$ $P(A\ or\ B) = P(A) + P(B) - P(A\ and\ B)$

$\hat{y} = a + bx$ $\quad$ $b = \frac{\sum(x - \overline{x})(y - \overline{y})}{\sum(x - \overline{x})^2}$

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MARKING GUIDLINES 2025

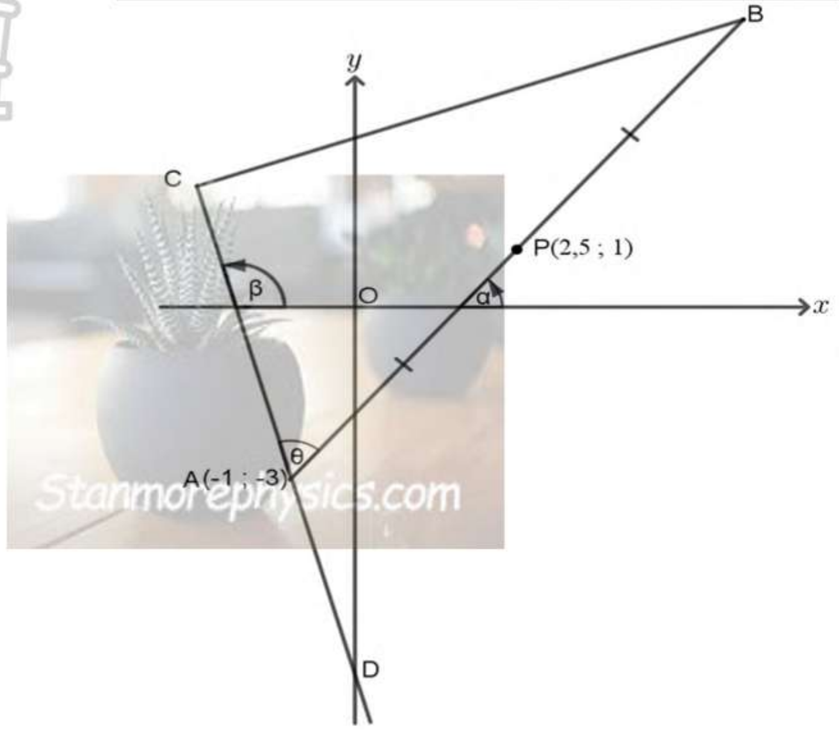
MARKS: 50

TIME: 1,5 hours

N.B. This marking guidelines consists of 6 pages.

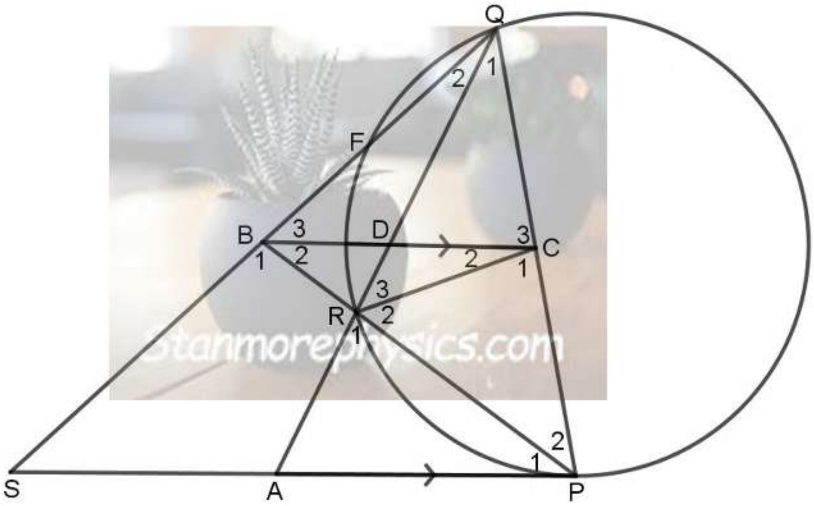
NOTE:	• If a leaner answers the question TWICE, only mark the FIRST attempt. • Consistence Accuracy applies in all aspects of the marking memorandum.

QUESTION 1



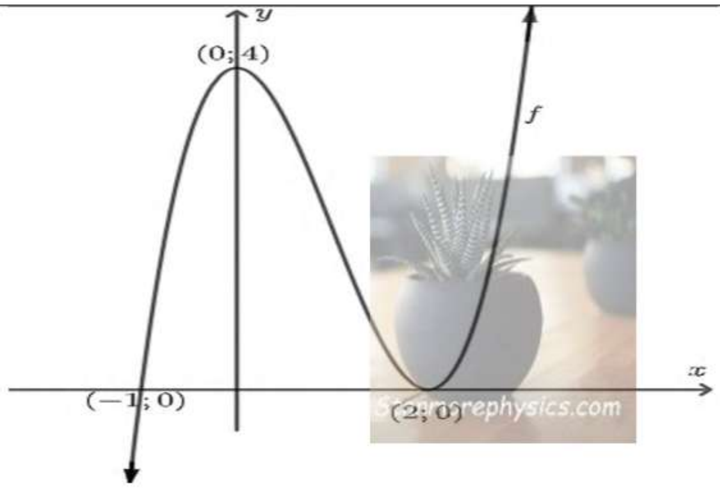
1.1	$y = -3x + k$ $-3 = (-3)(-1) + k$ **OR** *By inspection, using the gradient:* $k = -6$ $k = -6$	✓ substitution of $(-1;\ -3)$ ✓ $k = -6$ (2)
1.2	$\frac{x_A + x_B}{2} = x_P$ $\frac{-1 + x_B}{2} = \frac{5}{2}$ $x_B = 6$ $\therefore B(6\,;5)$ $\frac{y_A + y_B}{2} = y_P$ $\frac{-3 + y_B}{2} = 1$ $y_B = 5$	✓ 6 ✓ 5 (2)
1.3	$m_{AB} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{5-(-3)}{6-(-1)}$ $= \frac{8}{7}$ **OR** $m_{AB} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{1-(-3)}{2{,}5-(-1)}$ $= \frac{8}{7}$	✓ substitution ✓ gradient (2)
1.4	$\tan\beta = m_{AD} = -3$ $\beta = 108{,}43°$ $\tan\alpha = m_{AB} = \frac{8}{7}$ $\alpha = 43{,}81°$ $\theta = 108{,}43° - 48{,}81°$ $\theta = 59{,}62°$	✓ $\tan\beta = -3$ ✓ $\beta = 108{,}43°$ ✓ $\tan\alpha = \frac{8}{7}$ ✓ $\alpha = 43{,}81°$ ✓ $\theta = 59{,}62°$ (5)
		[11]

QUESTION 2



2.1	$\hat{B}_2 = \hat{P}_1 = x$ $(alt\ <^s; BC \parallel SP)$ $\hat{P}_1 = \hat{Q}_1 = x$ $(\tan chord\ theorem)$ $P_1 = \hat{P}_2 = x$ $(RP\ bisects\ Q\hat{P}S)$	✓✓ S & R ✓✓ S & R ✓✓ S & R (6)
2.2	$P_1 = \hat{P}_2$ $(proven)$ $PC = BC$ $(sides\ opp\ equal\ <^s)$	✓ S ✓ R (2)
2.3	$\hat{Q}_1 = \hat{B}_2 = x$ $(proven)$ $RCQB\ is\ a\ cyclic\ quadrilateral$ $(converse\ <^s\ in\ the\ same\ segment)$	✓ S ✓ R (2)
2.4	$\hat{P}_1 = \hat{Q}_1$ $(proven)$ $\hat{R}_3 = \hat{B}_3$ $(<^s\ in\ the\ same\ segment)$ $\hat{B}_3 = Q\hat{S}P$ $(corresp\ <^s; BC \parallel SP)$ $\hat{R}_3 = Q\hat{S}P$ $\hat{P}_1 = Q\hat{C}R$ $(3^{rd} < of\ \Delta)$ $\Delta PBS \parallel\mid \Delta QCR$ $(<<<)$	✓ S ✓ R ✓ S/R ✓ S/R ✓ R (5)
2.5	$\frac{PB}{QC} = \frac{BS}{CR}$ $(\Delta PBS \parallel\mid \Delta QCR)$ $PB.CR = BS.QC$ $\frac{QC}{CP} = \frac{QB}{BS}$ $(prop\ theorem\ BC \parallel SP)$ $BS.QC = QB.CP$ $\therefore PB.CR = QB.CP$	✓ S & R ✓ S ✓ R ✓ S (4)
		[19]

QUESTION 3		
3.1	$f(x) = -3x^2 + 1$ $f(x+h) = -3(x+h)^2 + 1 = -3x^2 - 6xh - 3h^2 + 1$ $f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h\to 0} \frac{-3x^2 - 6xh - 3h^2 + 1 + 3x^2 - 1}{h}$ $f'(x) = \lim_{h\to 0} \frac{-6xh - 3h^2}{h}$ $f'(x) = \lim_{h\to 0} \frac{h(-6x - 3h)}{h}$ $f'(x) = \lim_{h\to 0} -6x - 3h$ $f'(x) = -6x - 3(0)$ $f'(x) = -6x$	✓$f(x+h) = -3x^2 - 6xh - 3h^2 + 1$ ✓Substitution into correct formula. ✓Simplification ✓Common factor ✓Answer (5)
3.2		
3.2.1	$f(x) = \frac{2}{3}x^3 - 2x$ $f'(x) = 2x^2 - 2$	✓$2x^2$ ✓-2 (2)
3.2.2	$D_x\left[\sqrt[5]{x} + \frac{7}{x}\right]$ $= D_x\left[x^{\frac{1}{5}} + 7x^{-1}\right]$ $= \frac{1}{5}x^{-\frac{4}{5}} - 7x^{-2}$	✓$x^{\frac{1}{5}} + 7x^{-1}$ ✓$\frac{1}{5}x^{-\frac{4}{5}}$ ✓$-7x^{-2}$ (3)
		[10]

QUESTION 4		
4.1	$f(x) = 0 => x^3 - 3x^2 + 4 = 0$ $(x+1)(x^2 + \Delta x + 4) = 0$ $\Delta x + 4x = 0x$ $\Delta x = -4x$ $\Delta = -4$ $(x+1)(x^2 - 4x + 4) = 0$ $(x+1)(x-2)(x-2) = 0$ $x = -1 \ or \ x = 2$ $\therefore x - intercepts \ are (-1; 0) \ and \ (2; 0)$	✓$(x+1)$ ✓$(x^2 - 4x + 4)$ ✓ both x-values (3)
4.2	$f'(x) = 3x^2 - 6x$ $3x^2 - 6x = 0$ $3x(x-2) = 0$ $x = 0 \ or \ x = 2$ $f(0) = (0)^3 - 3(0)^2 + 4 = 4$ $f(2) = (2)^3 - 3(2)^2 + 4 = 0$ $\therefore the \ turning \ points \ are \ (0; 4) \ and \ (2,0)$	✓ derivative = 0 ✓ both x values ✓ both y-values (3)
4.3		✓ x-intercepts ✓ turning points and y-intercept ✓ shape (3)
4.4	$k > 4$	✓ $k > 4$ (1)
		[10]
		TOTAL:50