

TEST SCHOOL
121/2 MATHEMATICS
Paper 2
Form 4 End Term Examination

Time: 2 ½ Hours

Name: Adm No:
 School: Class:
 Signature: Date:

INSTRUCTIONS TO CANDIDATES

- (a) Write your name and index number in the spaces provided at the top of this page.
- (b) Write your school name, sign and write the date of the examination in the spaces provided above.
- (c) This paper consists of **Two** sections: **Section I** and **Section II**.
- (d) Answer **ALL** questions in Section I and any **five questions** from Section II.
- (e) Marks may be given for correct working, relevant points, and clear presentation.
- (f) Non-programmable silent electronic calculators may be used where necessary.
- (g) KNEC Mathematical Tables may be used.
- (h) This paper consists of **8 printed pages**.
- (i) Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.
- (j) Candidates should answer the questions in English.

For Examiner's Use Only

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

SECTION II

17	18	19	20	21	22	23	24	Total	Grand Total

SECTION I

1. A rectangular field measures 120 m by 80 m, measured to the nearest metre. Calculate the maximum possible area of the field and the percentage error in this maximum area.

2. Solve for x : $3^{2x+1} = 27$.

3. Simplify and rationalise the denominator: $\frac{\sqrt{5} + \sqrt{2}}{\sqrt{5} - \sqrt{2}}$.

4. y varies directly as x and inversely as the square of z . Given that $y = 12$ when $x = 6$ and $z = 2$, find y when $x = 9$ and $z = 3$.

5. Solve for x : $\log_{10} x + \log_{10} (x + 3) = 1$.

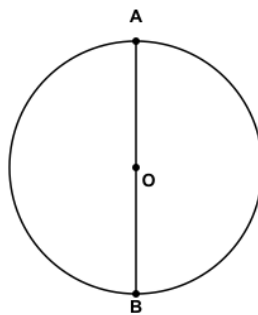
6. Solve the equation $2x^2 - 5x - 3 = 0$ by completing the square.

7. If P varies jointly as q and the square root of r , and $p = 20$ when $q = 5$ and $r = 16$, find the constant of variation k .

8. The third term of a geometric progression is 16 and the sixth term is 128. Find the first term and the common ratio.

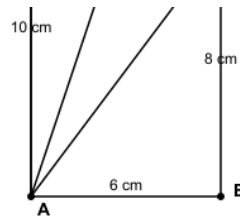
9. Given that $\sin \theta = -\frac{4}{5}$ and θ lies in the third quadrant ($180^\circ < \theta < 270^\circ$), find the exact value of $\cos \theta$.

10. Find the equation of a circle whose centre is $(2, -1)$ and radius 3 units. Express your answer in the form $x^2 + y^2 + ax + by + c = 0$.

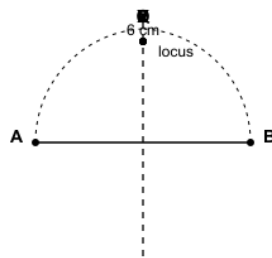


11. Given matrix $A = \begin{pmatrix} 3 & 4 \\ 2 & k \end{pmatrix}$ and $\det(A) = 1$, find the value of k .

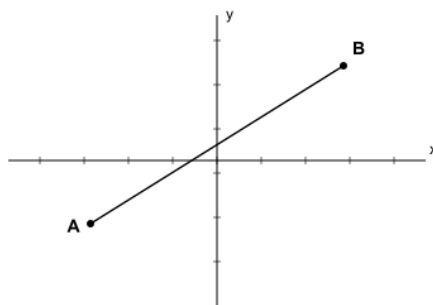
12. The diagram below shows a rectangular prism $ABCDEFGH$ with $AB = 6$ cm, $BC = 8$ cm, and $AE = 10$ cm. Calculate the angle between line AG and the plane $ABCD$.



13. Two points P and Q are 6 cm apart. On the diagram below, construct the locus of points that are equidistant from P and Q and also equidistant from lines PX and QY where PX and QY are perpendicular to PQ at P and Q respectively. Describe the locus.

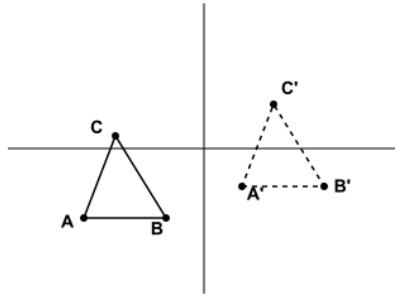


14. Find the area bounded by the curve $y = x^2 + 2$, the x -axis, and the lines $x = 1$ and $x = 3$.



15. Two points X and Y on the equator have longitudes 30°E and 60°E respectively. Taking the radius of the Earth as 6370 km, calculate the distance between X and Y along the equator in kilometres. (Use $\pi = \frac{22}{7}$)

16. A transformation T is represented by the matrix $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$. A point $P(3, -2)$ is transformed under T to P' .



Determinen the coordinates of P'

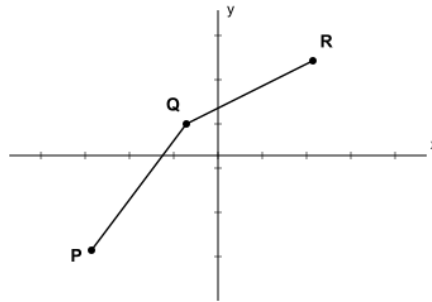
Describe fully the transformation T

SECTION II

Answer any five questions from this section.

17. The table below shows the distribution of masses (in kg) of 80 students. [10 marks]

Mass (kg)	40-44	45-49	50-54	55-59	60-64	65-69	70-74
Frequency	4	10	18	22	14	8	4



Calculate the mean mass.

Calculate the variance and standard deviation of the masses.

Using a cumulative frequency curve (ogive), estimate the median mass.

18. A businesswoman deposits Ksh 200,000 in a bank account that pays compound interest at a rate of 12% per annum, compounded monthly. She also starts a second account by depositing Ksh 100,000 at the beginning of each year for 5 years in a different bank that offers a simple interest rate of 10% per annum. [10 marks]

Calculate the amount in the first account after 3 years.

Calculate the total amount in the second account after 5 years.

Find the difference in the amounts from the two accounts after 5 years.

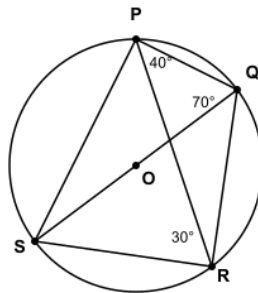
19. [10 marks]

Expand $(1 + 2x)^6$ up to the term in x^3 .

Use your expansion to estimate the value of $(1.02)^6$ correct to 4 significant figures.

Find the coefficient of x^4 in the expansion of $(1 + 3x)(1 - 2x)^5$.

20. In the diagram below, O is the centre of the circle. P , Q , R and S are points on the circumference. $\angle PQR = 70^\circ$, $\angle PRS = 30^\circ$, and $\angle QPR = 40^\circ$. [10 marks]

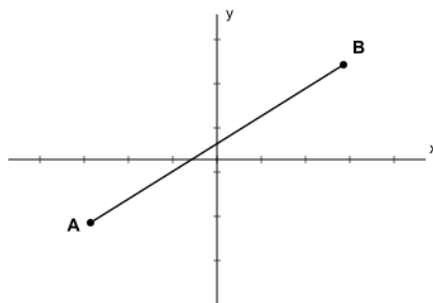


Calculate $\angle QRS$.

Calculate $\angle PQS$.

Show that $\angle PSR = 110^\circ$.

21. Consider the function $y = 3\sin(2x) - 1$ for $0^\circ \leq x \leq 360^\circ$. [10 marks]

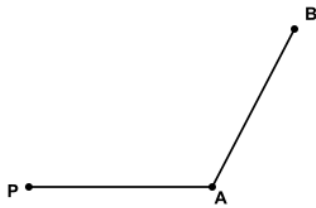


State the amplitude, period and phase shift.

Sketch the graph of the function for the given interval.

Determine the range of the function.

22. Vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ are such that $\vec{a} = \begin{pmatrix} 2 \\ -1 \\ 3 \end{pmatrix}$, $\vec{b} = \begin{pmatrix} 4 \\ 0 \\ -2 \end{pmatrix}$ and $\vec{c} = \begin{pmatrix} 1 \\ 5 \\ -1 \end{pmatrix}$. [10 marks]

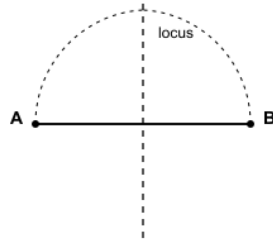


Find $|\vec{a} + \vec{b} - \vec{c}|$.

Given that point P divides the line segment joining $A(1, 2, 3)$ and $B(4, -1, 6)$ in the ratio $2 : 1$ externally, find the coordinates of P .

Show that vectors $\vec{a}$ and $\vec{b}$ are perpendicular.

23. A particle moves in a straight line such that its displacement s metres from a fixed point O after t seconds is given by $s = t^3 - 6t^2 + 9t + 5$, for $t \geq 0$. [10 marks]



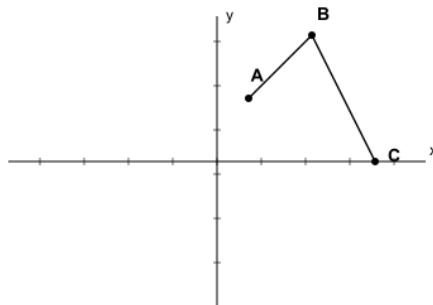
Determine the velocity of the particle when $t = 2$ seconds.

Find the time(s) when the particle is at rest.

Calculate the acceleration of the particle when $t = 1$ second.

Find the total distance travelled in the first 4 seconds.

24. A circle passes through the points $A(1, 2)$, $B(3, 4)$ and $C(5, 0)$. [10 marks]



Find the equation of the circle in the form $x^2 + y^2 + ax + by + c = 0$.

Determine the centre and radius of the circle.

Show that the line $y = x - 2$ is a tangent to the circle.

121/2 MATHEMATICS MARKING SCHEME

Form 4 Paper 2

SECTION I (50 marks)

1. A rectangular field measures 120 m by 80 m, measured to the nearest metre. (4 marks)

Calculate the maximum possible area of the field and the percentage error in this maximum area.

- Correctly identifies upper bounds: length = 120.5 m, width = 80.5 m (1)
- Calculates maximum area: $120.5 \times 80.5 = 9700.25 \text{ m}^2$ (1)
- Calculates absolute error: $9700.25 - 9600 = 100.25 \text{ m}^2$ (1)
- Calculates percentage error: $(100.25/9600) \times 100 \approx 1.04\%$ (1)

Alt:

— Upper bound area = $(120.5)(80.5) = 9700.25 \text{ m}^2$, measured area = 9600 m^2 , absolute error = 100.25 m^2 , percentage error = $(100.25/9600) \times 100\% \approx 1.04\%$

2. Solve for x: $3^{2x+1} = 27$. (2 marks)

- Writes 27 as 3^3 and equates exponents: $2x+1 = 3$ (1)
- Solves to get $x = 1$ (1)

Alt:

— $3^{(2x+1)} = 27 \rightarrow 3^{(2x+1)} = 3^3 \rightarrow 2x+1 = 3 \rightarrow x = 1$

3. Simplify and rationalise the denominator: $(\sqrt{5} + \sqrt{2})/(\sqrt{5} - \sqrt{2})$. (4 marks)

- Multiplies numerator and denominator by conjugate $(\sqrt{5} + \sqrt{2})$ (1)
- Numerator: $(\sqrt{5} + \sqrt{2})^2 = 5 + 2\sqrt{10} + 2 = 7 + 2\sqrt{10}$ (1)
- Denominator: $(\sqrt{5})^2 - (\sqrt{2})^2 = 5 - 2 = 3$ (1)
- Final simplified expression: $(7 + 2\sqrt{10})/3$ (1)

Alt:

— Multiply by $(\sqrt{5} + \sqrt{2})/(\sqrt{5} + \sqrt{2})$: numerator = $7 + 2\sqrt{10}$, denominator = 3, final = $(7 + 2\sqrt{10})/3$

4. y varies directly as x and inversely as the square of z. Given that $y=12$ when $x=6$ and $z=2$, find y when $x=9$ and $z=3$. (3 marks)

- Sets up variation equation: $y = kx / z^2$ (1)
- Substitutes given values to find k: $12 = k(6)/4 \rightarrow k = 8$ (1)
- Finds y when $x=9$, $z=3$: $y = 8(9)/9 = 8$ (1)

Alt:

— $k = (12 \times 4)/6 = 8$, then $y = 8 \times 9/9 = 8$

5. Solve for x: $\log_{10} x + \log_{10} (x+3) = 1$. (3 marks)

- Combines logs: $\log_{10}[x(x+3)] = 1$ (1)
- Writes exponential form: $x(x+3) = 10$ (1)

■ Solves quadratic $x^2+3x-10=0 \rightarrow (x+5)(x-2)=0$, rejects $x=-5$, gives $x=2$ (1)

Alt:

— $\log_{10}x + \log_{10}(x+3) = \log_{10}[x(x+3)] = 1 \rightarrow x(x+3)=10 \rightarrow x^2+3x-10=0 \rightarrow x=2$ or $x=-5$ (reject) $\rightarrow x=2$

6. Solve the equation $2x^2 - 5x - 3 = 0$ by completing the square. (4 marks)

■ Divides by 2: $x^2 - (5/2)x - 3/2 = 0$ (1)

■ Adds $(5/4)^2$ to both sides: $x^2 - (5/2)x + 25/16 = 3/2 + 25/16$ (1)

■ Writes as $(x-5/4)^2 = 49/16$ (1)

■ Solves: $x = 5/4 \pm 7/4 \rightarrow x = 3$ or $x = -1/2$ (1)

Alt:

— Completing square: $(x-5/4)^2 = 49/16 \rightarrow x = 5/4 \pm 7/4 \rightarrow x=3$ or $x=-1/2$

7. If p varies jointly as q and the square root of r , and $p=20$ when $q=5$ and $r=16$, find the constant of variation k . (2 marks)

■ Writes joint variation: $p = k q \sqrt{r}$ (1)

■ Substitutes $p=20, q=5, r=16$: $20 = k \cdot 5 \cdot 4 \rightarrow k = 1$ (1)

Alt:

— $p = k q \sqrt{r} \rightarrow 20 = k \cdot 5 \cdot 4 \rightarrow k=1$

8. The third term of a geometric progression is 16 and the sixth term is 128. Find the first term and the common ratio. (3 marks)

■ Forms equations: $ar^2 = 16, ar^5 = 128$ (1)

■ Divides to find r : $r^3 = 128/16 = 8 \rightarrow r = 2$ (1)

■ Substitutes to find a : $a \cdot 4 = 16 \rightarrow a = 4$ (1)

Alt:

— $ar^2=16, ar^5=128 \rightarrow r^3=8 \rightarrow r=2 \rightarrow a=16/4=4$

9. Given that $\sin \theta = -(4)/(5)$ and θ lies in the third quadrant ($180^\circ < \theta < 270^\circ$), find the exact value of $\cos \theta$. (2 marks)

■ Uses identity $\sin^2 \theta + \cos^2 \theta = 1 \rightarrow \cos^2 \theta = 1 - (-4/5)^2 = 9/25$ (1)

■ Decides sign: θ in third quadrant, $\cos$ negative $\rightarrow \cos \theta = -3/5$ (1)

Alt:

— $\cos^2 \theta = 1 - 16/25 = 9/25 \rightarrow \cos \theta = \pm 3/5$; third quadrant $\rightarrow \cos \theta = -3/5$

10. Find the equation of a circle whose centre is $(2, -1)$ and radius 3 units. Express your answer in the form $x^2 + y^2 + ax + by + c = 0$. (3 marks)

■ Applies circle equation: $(x-2)^2 + (y+1)^2 = 3^2$ (1)

■ Expands: $x^2 - 4x + 4 + y^2 + 2y + 1 = 9$ (1)

■ Simplifies to general form: $x^2 + y^2 - 4x + 2y - 4 = 0$ (1)

Alt:

— $x^2 + y^2 - 4x + 2y - 4 = 0$

11. Given matrix $A = \begin{pmatrix} 3 & 4 \\ 2 & k \end{pmatrix}$ and $\det(A) = 1$, find the value of k . (2 marks)

■ Uses determinant formula: $\det(A) = ad - bc = 3(k) - 4(2) = 3k - 8$ (1)

■ Sets equal to 1: $3k - 8 = 1 \rightarrow k = 3$ (1)

Alt:

— $3k - 8 = 1 \rightarrow k = 3$

12. The diagram below shows a rectangular prism ABCDEFGH with $AB = 6$ cm, $BC = 8$ cm, and $AE = 10$ cm. Calculate the angle between line AG and the plane ABCD. (3 marks)

■ Finds diagonal AC of base: $AC = \sqrt{6^2 + 8^2} = 10$ cm (1)

■ Identifies right triangle ACG with $CG = AE = 10$ cm, angle at C is 90° (1)

■ Uses tan: $\tan(\angle GAC) = CG/AC = 10/10 = 1 \rightarrow \angle GAC = 45^\circ$ (1)

Alt:

— Angle between AG and base = $\angle GAC$; $AC = 10$, $CG = 10 \rightarrow \tan(\angle) = 1 \rightarrow 45^\circ$

13. Two points P and Q are 6 cm apart. On the diagram below, construct the locus of points that are equidistant from P and Q and also equidistant from lines PX and QY where PX and QY are perpendicular to PQ at P and Q respectively. Describe the locus. (3 marks)

■ Identifies locus equidistant from P and Q as perpendicular bisector of PQ (1)

■ Identifies locus equidistant from parallel lines PX and QY as a line parallel to them midway (1)

■ Finds intersection: midpoint of PQ (3,1) $\rightarrow$ locus is a single point (3,1) (1)

Alt:

— Point equidistant from P and Q is on perpendicular bisector; equidistant from lines is on line midway; intersection is midpoint of PQ: (3,1)

14. Find the area bounded by the curve $y = x^2 + 2$, the x-axis, and the lines $x = 1$ and $x = 3$. (3 marks)

■ Sets up definite integral: $\int_1^3 (x^2 + 2) dx$ (1)

■ Integrates correctly: $[x^3/3 + 2x]$ from 1 to 3 (1)

■ Evaluates: $(27/3 + 6) - (1/3 + 2) = 15 - 7/3 = 38/3$ square units (1)

Alt:

— $\int_1^3 (x^2 + 2) dx = [x^3/3 + 2x]_1^3 = (9 + 6) - (1/3 + 2) = 38/3$

15. Two points X and Y on the equator have longitudes 30° E and 60° E respectively. Taking the radius of the Earth as 6370 km, calculate the distance between X and Y along the equator in kilometres. (Use $\pi = (22)/7$) (2 marks)

■ Finds difference in longitude: 30° (1)

■ Applies arc length formula: $(30/360) \times 2\pi \times 6370 = (1/12) \times (44/7) \times 6370 = 3336 \frac{2}{3}$ km (1)

Alt:

— Distance = $(\theta/360) \times 2\pi R = (30/360) \times (44/7) \times 6370 = 3336.67$ km

16. A transformation T is represented by the matrix $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$. A point P(3, -2) is transformed under T to P'. (4 marks)

■ (a) Multiplies matrix by vector: $T(3, -2) = (-2, 3)$ (2)

■ (a) Correct coordinates P'(-2, 3) (1)

■ (b) Identifies transformation as reflection in line $y=x$ (1)

Alt:

— $T(3, -2) = (0 \cdot 3 + 1 \cdot (-2), 1 \cdot 3 + 0 \cdot (-2)) = (-2, 3)$; transformation: reflection in $y=x$

SECTION II (50 marks)

17. The table below shows the distribution of masses (in kg) of 80 students. (10 marks)

■ (a) Finds midpoints: 42, 47, 52, 57, 62, 67, 72 (1)

■ (a) $\sum fx = 4 \times 42 + 10 \times 47 + 18 \times 52 + 22 \times 57 + 14 \times 62 + 8 \times 67 + 4 \times 72 = 4520$ (1)

■ (a) Mean = $4520/80 = 56.5$ kg (1)

■ (b) Computes $\sum f(x - \text{mean})^2$ correctly (allow 5440) (2)

■ (b) Variance = $5440/80 = 68.0$, standard deviation = $\sqrt{68} \approx 8.25$ kg (2)

■ (c) Constructs cumulative frequency table: 4, 14, 32, 54, 68, 76, 80 (1)

■ (c) Draws ogive and reads median at 40th value $\rightarrow \approx 57.5$ kg (accept 57.3-57.7) (2)

Alt:

— Mean = $\sum fx / \sum f = 4520/80 = 56.5$; variance = $\sum f(x - \bar{x})^2 / n = 5440/80 = 68$, SD = 8.25; median from ogive ≈ 57.5 kg

18. A businesswoman deposits Ksh 200,000 in a bank account that pays compound interest at a rate of 12% per annum, compounded monthly. She also starts a second account by depositing Ksh 100,000 at the beginning of each year for 5 years in a different bank that offers a simple interest rate of 10% per annum. (10 marks)

■ (a) Rate per month = $12\% / 12 = 1\%$, number of periods = 36 (1)

■ (a) Amount = $200000(1+0.01)^{36} = 200000 \times 1.43077 \approx 286154$ (2)

■ (a) Correct amount to nearest shilling: Ksh 286,154 (1)

■ (b) Recognises each deposit earns simple interest for different periods (1)

■ (b) Computes total: $100000 \times 5 + 0.1 \times 100000 \times (5+4+3+2+1) = 500000 + 10000 \times 15 = 650000$ (2)

■ (b) Correct amount: Ksh 650,000 (1)

■ (c) Difference = $650000 - 286154 = 363846$ (2)

Alt:

— First account: $A = 200000(1.01)^{36} = 286154$; Second account: sum of $100000(1+0.1(6-k))$ for $k=1..5 = 650000$; difference = 363846

19. (10 marks)

■ (a) Writes binomial expansion: $(1+2x)^6 = 1 + 6(2x) + 15(2x)^2 + 20(2x)^3 + \dots$ (2)

- (a) Correct expansion up to x^3 : $1 + 12x + 60x^2 + 160x^3$ (1)
 - (b) Substitutes $x=0.01$ into expansion: $1 + 0.12 + 0.006 + 0.00016 = 1.12616$ (2)
 - (b) Rounds to 4 significant figures: 1.126 (1)
 - (c) Expands $(1-2x)^5$ correctly up to x^4 : $1 - 10x + 40x^2 - 80x^3 + 80x^4$ (2)
 - (c) Multiplies by $(1+3x)$ and extracts coefficient of x^4 : $(1)(80) + (3)(-80) = 80 - 240 = -160$ (2)
- Alt:
- (a) $1+12x+60x^2+160x^3$; (b) Substitute $x=0.01 \rightarrow 1.12616 \approx 1.126$; (c) Coefficient = -160

20. In the diagram below, O is the centre of the circle. P, Q, R and S are points on the circumference. angle PQR = 70° , angle PRS = 30° , and angle QPR = 40° . (10 marks)

- (a) Uses cyclic quadrilateral: $\angle PQR + \angle PSR = 180^\circ \rightarrow \angle PSR = 110^\circ$ (1)
- (a) Uses triangle PQR: $\angle PRQ = 180 - 70 - 40 = 70^\circ$ (1)
- (a) $\angle QRS = \angle PRQ + \angle PRS = 70 + 30 = 100^\circ$ (1)
- (b) Uses angles subtended by same arc: $\angle PQS = \angle PRS = 30^\circ$ (2)
- (b) Correct angle: 30° (1)
- (c) States $\angle PQR + \angle PSR = 180^\circ$ (opposite angles of cyclic quad) (2)
- (c) Therefore $\angle PSR = 180 - 70 = 110^\circ$ (2)

Alt:

— (a) $\angle QRS = 180 - \angle QPS$, but better: $\angle QRS = \angle PRQ + \angle PRS = 70 + 30 = 100$; (b) $\angle PQS = \angle PRS = 30$; (c) $\angle PSR = 180 - \angle PQR = 110$

21. Consider the function $y = 3\sin(2x) - 1$ for $0^\circ \leq x \leq 360^\circ$. (10 marks)

- (a) Amplitude = 3, period = 180° , phase shift = 0 (3)
- (b) Correctly labelled axes and key points (max at $(45^\circ, 2)$, min at $(135^\circ, -4)$, midline $y = -1$) (4)
- (b) Sketch shows one complete wave from 0° to 360° (two periods) (1)
- (c) Range: $-4 \leq y \leq 2$ (2)

Alt:

— Amplitude=3, period= 180° , shift=none; graph: shape correct; range: $y \in [-4, 2]$

22. Vectors veca , vecb and vecc are such that $\text{veca} = \begin{pmatrix} 2 \\ -1 \\ 3 \end{pmatrix}$, $\text{vecb} = \begin{pmatrix} 4 \\ 0 \\ -2 \end{pmatrix}$ and $\text{vecc} = \begin{pmatrix} 1 \\ 5 \\ -1 \end{pmatrix}$. (10 marks)

- (a) Computes vector sum: $a+b-c = (2+4-1, -1+0-5, 3-2+1) = (5, -6, 2)$ (1)
- (a) Magnitude = $\sqrt{5^2 + 6^2 + 2^2} = \sqrt{65} \approx 8.0623$ (2)
- (a) Correct value: $\sqrt{65}$ (1)
- (b) Applies external section formula: $P = (2B-1A)/(2-1) = 2(4, -1, 6) - (1, 2, 3) = (7, -4, 9)$ (3)
- (b) Correct coordinates: $(7, -4, 9)$ (1)

■ (c) Computes dot product: $a \cdot b = 2 \times 4 + (-1) \times 2 + 3 \times (-2) = 8 - 2 - 6 = 0$ (1)

■ (c) Concludes perpendicular since dot product = 0 (1)

Alt:

— (a) $a+b+c=(5,-6,2)$, $|v|=\sqrt{65}$; (b) $P=(7,-4,9)$; (c) $a \cdot b = 0 \rightarrow$ perpendicular

23. A particle moves in a straight line such that its displacement s metres from a fixed point O after t seconds is given by $s = t^3 - 6t^2 + 9t + 5$, for $t \geq 0$. (10 marks)

■ (a) Differentiates to get $v = 3t^2 - 12t + 9$ (1)

■ (a) Substitutes $t=2$: $v = 12 - 24 + 9 = -3$ m/s (1)

■ (b) Sets $v=0$: $3t^2 - 12t + 9 = 0 \rightarrow t^2 - 4t + 3 = 0 \rightarrow t=1$ or $t=3$ (2)

■ (b) Both values: $t=1$ s and $t=3$ s (1)

■ (c) Differentiates to get $a = 6t - 12$ (1)

■ (c) Substitutes $t=1$: $a = 6 - 12 = -6$ m/s² (1)

■ (d) Computes displacements: $s(0)=5$, $s(1)=9$, $s(3)=5$, $s(4)=9$ (1)

■ (d) Total distance = $|9-5| + |5-9| + |9-5| = 4+4+4 = 12$ m (2)

Alt:

— (a) $v=3t^2-12t+9$, at $t=2$ $v=-3$; (b) $v=0$ at $t=1,3$; (c) $a=6t-12$, at $t=1$ $a=-6$; (d) distance = 12 m

24. A circle passes through the points A(1, 2), B(3, 4) and C(5, 0). (10 marks)

■ (a) Substitutes points into general equation: $x^2+y^2+ax+by+c=0$ (1)

■ (a) Forms system: A: $1+4+a+2b+c=0 \rightarrow a+2b+c=-5$; B: $9+16+3a+4b+c=0 \rightarrow 3a+4b+c=-25$; C: $25+0+5a+0b+c=0 \rightarrow 5a+c=-25$ (2)

■ (a) Solves to get $a=0$, $b=-10$, $c=-25$ (1)

■ (a) Equation: $x^2+y^2-10y-25=0$