1. Quadratic expressions and equation 2

1. Complete the table below for the function $y = 2x^3 + 5x^2 - x - 6$ (2 mks)

x	-4	-3	-2	-1	0	1	2
$2x^3$	-128	-54			0	2	16
$5x^2$	80	45	20	5	0	5	20
-x	4	3			0	-1	
-6	-6	-6	-6	-6	-6	-6	-6
y	-50				-6	0	

(b) On the grid provided draw the graph $y = 2x^3 + 5x^2 - x - 6$ for $-4 \le x \le 2$. Use 2cm to represent 1 unit on the x-axis and 1 cm to represent 5 units on the y – axis (4 mks)

(c) By drawing a suitable line, use the graph in (b) to solve the

i. equation $2x^3 + 5x^2 + x - 4 = 0$ (2 mks)

ii. equation $2x^3 + 5x^2 - x + 2 = 0$ (2 mks)

2. The curve $y = 2x^2 - 6x + 9$ passes through the point P(2, 5)

(a) Determine the gradient function of the curve (1 mk)

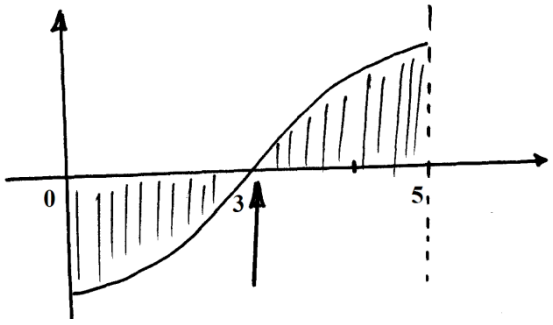
(b) Determine the coordinates and nature of the turning point of the curve (5mks)

(c) Find the equation in the form $y = mx + c$ of the

(i) Tangent to the curve at P (2mks)

(ii) Normal to the curve at P (2mks)

3. The sketch below represents the graph of $y = x^2 - x - 6$. Use the curve and five trapezia to estimate the area bounded by the x – axis, y – axis and the line x = 5. (3mks)



4. Draw the graph of y = 2x2 + x – 2 and use it to solve the equations (10 marks)
   a) $2x^2 + x - 2 = 5$
   b) $2x^2 + x - 5 = 0$
   c) $2x^2 + 2x - 3 = 0$

5. Plot a graph of $y = 2x^2 + 3x - 5$, $-4 \le x \le 2$ by completing the table below.

x	-4	-3	-2	-1	0	1	2
$2x^2$		-18			0		
3x	-12			-3			6
-5							
y			-3			0	

Use your graph to solve

(i) $2x^2 + 3x - 5 = 0$

(ii) $2x^2 + 6x - 2 = 0$

6. Given the equation of a quadratic curve $y = x^2 + 5x - 3$

(a) (i) Complete the table below for the function $y = x^2 + 5x - 3$ for $-6 \leq x \leq 1$

x	-6	-5	-4	-3	-2	-1	0	1
y		-3	-7		-9		-3	3

(2mks)

(ii) Draw the graph of $y = x^2 + 5x - 3$ for $-6 \leq x \leq 1$ (3mks)

(b) (i) State the equation of the line of symmetry for the graph (1mk)

(ii) Use the graph you have drawn to solve the equations;

$x^2 + 5x - 3 = 0$ (1mk)

$x^2 + 4x - 2 = 0$ (2mks)

$x^2 + 5x - 3 = -3$ (2mks)

7. (a) Draw the graph of

$y = 2x^2 - x - 3$ for $-3 \leq x \leq 3$ (5 marks)

(b) Using a suitable line solve

$2x^2 - 3x - 50 = 0$ (5 marks)

8. (a) Draw the graph of $y = x^2 + 4x + 1$ for $-4 \leq x \leq 2$. (Show the table of values)

(b) On the same axis, draw line $y = 3x + 2$.

(c) Use the graph to solve the equations

(i) $x^2 + 4x + 1 = 0$

(ii) $x^2 + x - 1 = 0$

9. a) Draw the graph of the equation

$y = x^3 - 9x$ for $-4 \leq x \leq 4$

b) Use your graph to solve the following equations

i) $x^3 = 9x$

ii) $y - 5 = 0$

iii) $0 = x^3 - 13x - 12$ (10 Mks)

10. On the grid provided draw the graph of $y = x^3 - 3x^2 - 9x + 2$ for $-3 \leq x \leq 5$ (5 marks)

a) Use your graph to solve :

i. $x^3 - 3x^2 - 9x + 2 = 0$ (2 mark)

ii. $x^3 - 3x^2 - 6x + 8 = 0$ (3 marks)

11. (a) Use a convenient scale to draw the graph of $y = -x^2 + 5x - 3$ for the range $-2 \leq x \leq 6$

(b) Use your graph to determine the roots of the equation $5x - x^2 - 3 = 0$

(c) Use your graph to solve the equation $2x - x^2 + 3 = 0$ by drawing a suitable straight line

12. Find a quadratic equation whose roots are $2.5 + \sqrt{3}$ and $2.5 - \sqrt{3}$, expressing it in the form $ax^2 + bx + c = 0$ Where a, b and c are integers

13. Find the products of 17.3 and 13.8. Find also the percentage error in getting the product.

14. (a) Complete the table below for the equation :- $y = x^2 + 3x - 6$ for $-6 \leq x \leq 4$

x	-6	-5	-4	-3	-2	-1	0	1	2	3	4
y	12			-6			-6				22

(b) Using a scale 1cm to represent 2 units in both axes. Draw the graph of $y = x^2 + 3x - 6$

(c) Use your graph to solve:-

(i) $X^2 + 3X = 6$

(ii) $X^2 + 3X - 2 = 0$

15. (a) Complete the table for the function: $y = 2x^2 + 3x + 1$

x	- 4	-3	-2	-1	0	1	2	3
$\mathbf{2x^2}$		18			0			18
3x + 1		-7			0			10
y		11			1	6		

(b) Use the table in **(a)** above to draw the graph : - $y = 2x^2 + 3x + 1$ for $-4 \leq x \leq 3$

(c) Use the graph in **(b)** to solve the equation :-

(i) $2x^2 + 4x - 3 = 0$

(ii) $x^2 + \frac{3}{2}x + 2 = 3$

16. A youth group decided to raise Ksh 480,000 to buy a piece of land costing Ksh. 80,000 per hectare. Before the actual payment was made, four of the members pulled out and each of those remaining had to pay an additional Kshs. 20,000.

(a) If the original number of the group members was **x**, write down;

(i) An expression of how much each was to contribute originally.

(ii) An expression of how the remaining members were to contribute after the four pulled out.

(b) Determine the number of members who actually contributed towards the purchase of the land.

(c) Calculate the ratio of the supposed original contribution to the new contribution.

(d) If the land was sub-divided equally, find the size of land each member got. (2 mk)

17. a) Draw the graph of $y = 2\boldsymbol{x}^2 + x - 2$ given the range $-3 \leq \boldsymbol{x} \leq 2$

b) Use your graph above to solve

i) $2\boldsymbol{x}^2 + \boldsymbol{x} - 2 = 0$

ii) $2\boldsymbol{x}^2 + \boldsymbol{x} - 3 = 0$

iii) $2\boldsymbol{x}^2 + \boldsymbol{x} - 5 = 0$

18. Three planes **A**, **B** and **C** leave an airport **P** simultaneously at 9.30a.m. Plane **A** flies on a bearing of 070^o from P at a speed of 400km/h. Plane **B** flies on a bearing of 290^oat a speed of 500km/h. Plane C flies on a bearing of 162^o from **P** at a speed of 300km/h.

(***Use scale drawing for this questio***n)

(a) Show by scale drawing, the relative positions of the 3planes A, B and C three hours after leaving airport P. (Use scale 1cm represents 200km)

(b) After 3 hours, **B** turns and head straight to the current position of **A** at the same speed it had. Determine the scale drawing , the time it takes to reach this point, to the nearest minute

(c) Determine the bearing and distance of **B** from **C** after the first 3 hours of flight after leaving **P**

19. a) Use trapezoidal rule to find the area between the curve $y = x^2 + 4x + 4$, the x- axis and the co-ordinates x = - 2 and x = 1. Take values of x at intervals of ½ unit.

b) Use integration to find the exact area. Hence find the percentage error in your approximation.

20. a) Use trapezoidal rule to find the area between the curve $y = x^2 + 4x + 4$, the x- axis and the co-ordinates x = - 2 and x = 1. Take values of x at intervals of ½ unit.

b) Use integration to find the exact area. Hence find the percentage error in your approximation.

21. Draw the graph of $y = 2x^2 – 4x - 5$ for x between -3 and 5 on the grid provided

(a) State the line of symmetry for the graph

(b) State the range of values for which $2x^2 – 4x – 5 \leq 0$

(c) On the same set of axes, draw the graph of $y=2x +3$

(d) Determine the solutions to the equation: $2x^2 – 4x – 5 = 2x +3$

22. Complete the table below for the equation $y = 5 + 3x -2x^2$ by filling in the blank space

X	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2	2.5	3	3.5
Y	-9			3		6	6				-4	

(i) Use the values from the table above to draw the graph of $y = 5 + 3x -2x^2$ (3mks

(ii) Use the graph to:-

(a) Find the maximum point of the function $5 + 3x -2x^2$

(b) Determine the range of values and give the integral values which satisfy the inequality $5 + 3x -2x^2 \geq -2$

23. (a) Complete the table below for the function $y = 2x^2 + 4x – 3$

x	-4	-3	-2	-1	0	1	2
$2x^2$	32		8	2	0		
4x – 3			-11		-3		5
y			-3			3	13

(b) Draw the graph of the function $y = 2x^2 + 4x – 3$ and use your graph to estimate the roots of the equation $2x^2 + 4x – 3 = 0$.

(c) In order to solve graphically the equation $2x^2 + x – 5 = 0$, a straight line must be drawn to intersect the curve $y = 2x^2 + 4x – 3$. Determine the equation of this line, draw it and hence obtain the roots of the equation $2x^2 + x – 5 = 0$ to 1 decimal place.

24. a) Complete the table for the function $\mathbf{y = 1 – 2x – 3x^2 \quad - 3 \leq x \leq 3.}$

x	-3	-2	-1	0	1	2	3
$\mathbf{-3x^2}$	-27		-3	0		-12	
-2x		4		0			-6
1	1	1	1	1	1	1	1
y	-20			1		-15	

b) Using the table above, draw the graph of $\mathbf{y = 1 – 2x – 3x^2}$ (Scale 1 cm represent 0.5 units on

x-axis and 1 cm rep 2 units on the **y – axis** on the grid provided.

c) Use the graph in **(b)** above to solve.

(i) $\mathbf{1 - 2x - 3x^2 = 0}$

(ii) $\mathbf{2 - 5x - 3x^2 = 0}$

25. A quadratic equation $\mathbf{x^2 + ax - b = 0}$ has roots **1** and **-5** , determine the values of **a** and **b**

26. Find a quadratic equation whose roots are $1.5 + \sqrt{2}$ and $1.5 - \sqrt{2}$, expressing it in the form $ax^2 + bx + c = 0$, where a, b, and c are integers

27. If $a^2 + b^2 = 89$ and $a + b = 13$

(a) Find the values of;

(i) $a^2 + 2ab + b^2$

(ii) $2ab$

(iii) $a^2 - 2ab + b^2$

(iv) $a - b$

(b) Determine the values of a and b