1. Graphical Methods

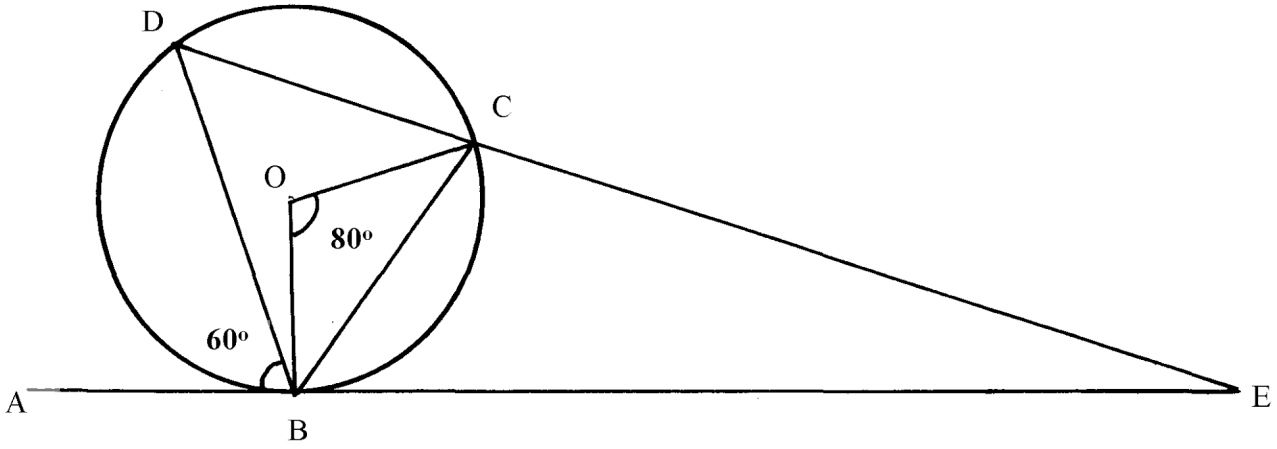
1. The equation of a circle is given as

   $2x^2 + 2y^2 - 8x + 5y + 10 = 0$. Find the radius of the circle and the coordinates of its centre. (3 mks)

2. The equation of a circle is given by $x^2 + 4x + y^2 - 5 = 0$. Find the centre of the circle and its radius.

3. The equation of a circle is $x^2 + y^2 + 6x - 10y - 2 = 0$. Determine the co-ordinates of the centre of the circle and state its radius

4. In the diagram below ABE is a tangent to a circle at B and DCE is a straight line. If ABD = 60°, BOC = 80° and O is the centre of the circle, find with reasons ∠BEC



5. Obtain the centre and the radius of the circle represented by the equation:
   $x^2 + y^2 - 10y + 16 = 0$

6. Complete the table below, for the function $y = x^3 + 6x^2 + 8x$

x	-5	-4	-3	-2	-1	0	1
x^3	-125		-27	-8		0	1
$6x^2$		96	54		6	0	6
8x	-40		-24			0	8
y			3	0		0	15

   (a) Draw a graph of the function $y = x^3 + 6x^2 + 8x$ for $-5 \leq x \leq 1$ and use the graph to estimate the roots of the equation $x^3 + 6x^2 + 8x = 0$

   (b) Find which values of **x** satisfy the inequality $x^3 + 6x^2 + 8x - 1 > 0$

7. Sketch the curve of the function $y = x^3 - 3x + 2$ showing clearly minimum and maximum points and the y – intercept.

8. Show that $4y^2 + 4x^2 = 12x - 12y + 7$ is the equation of a circle, hence find the co-ordinates of the centre and the radius

9. Two variables R and P are connected by a function $R = KP^n$ where K and n are constants. The table below shows data involving the two variables

P	3	3.5	4	4.5	5

R	36	49	64	81	100

(a) Express $\mathbf{R = KP^n}$ in a linear form
(b) Draw a line graph to represent the information above
(c) Find the values of constants **K** and **n**
(d) Write down the law connecting **R** and **P**
(e) Find the value of **P** when **R** = **900**

10. A circle of radius 3cm has the centre at (-2, 3) . Find the equation of the circle in the form of $x^2 + y^2 + Px + qy + c = 0$

11. In an experiment, the values of two quantities V and T were observed and the results recorded as shown below.

V	0	2	4	6	8	10
T	0.49	0.30	0.24	0.20	0.16	0.137

It is known that **T** and **V** are related by a law of the form $T = \frac{a}{b + V}$ where **a** and **b** are constants.

a) Draw the graph of $\frac{I}{T}$ against V

b) Use your graph to find;
i) The values of **a** and **b**.
ii) **V** when **T** = 0.38
iii) **T** when **V** = 4.5

12. Find the equation of the tangent to the curve $y = 2x^3 + x^2 + 3x - 1$ at the point (1, -5) expressing you answer in the form $y = mx + c$

13. Given that :- $243 = (81)^{-1} \times (\frac{1}{27})^x$ determine the value of x

14. Show that $3x^2 + 3y^2 + 6x - 12y - 12 = 0$ is an equation of a circle hence state the radius and centre of the circle

15. (a) Fill in the table below for the function $\mathbf{y = -6 + x + 4x^2 + x^3}$ **for** $\mathbf{-4 \leq x \leq 2}$

x	-4	-3	-2	-1	0	1	2
-6	-6	-6	-6	-6	-6	-6	-6
x	-4	-3	-2	-1	0	1	2
$4x^2$			16			4	
x^3							
y							

(b) Using the grid provided draw the graph for $\mathbf{y = -6 + x + 4x^2 + x^3}$ **for** $\mathbf{-4 \leq x \leq 2}$

(c) (i) Use the graph to solve the equations:-
(i) $x^3 + 4x^2 + x - 4 = 0$
(ii) $-6 + x + 4x^2 + x^3 = 0$
(iii) $-2 + 4x^2 + x^3 = 0$

16. The table below shows the results obtained from an experiment to determine the relationship

between the length of a given side of a plane figure and its perimeter

Length of side ι (cm)	1	2	3	4	5
Perimeter P(cm)	6.28	12.57	18.86	21.14	31.43

(a) On the grid provided, draw a graph of perimeter **P**, against ι
(b) Using your graph determine;
(i) the perimeter of a similar figure of side 2.5cm
(ii) the length of a similar figure whose perimeter is 9.43cm
(iii) the law connecting perimeter p and the length ι
(c) If the law is of the **form P = 2kι + c** where **k** and **c** are constants, find the value of **k**

17. In an experiment with tungsten filament lamp, the reading below of voltage (V) current (I), power (P) and resistance (R)were obtained. It was established that **P** was related to **R** by a law $P = a R^n - 0.6$. Where **a** and **n** are constants.

V	1.30	2.00	2.80	4.40	5.70
I	1.50	1.80	2.10	2.50	2.90
P	0.73	2.05	3.28	7.44	10.62
R	0.89	1.13	1.33	1.78	1.99

Plot a suitable line graph and hence use it to determine the value of **a** and **n**

18. Find the gradient of a line joining the centre of a circle whose equation is $\mathbf{x^2 + y^2 - 6x = 3 - 4y}$ and a point P(6,7) outside the circle..

19. a) Complete the table below for the function $\mathbf{y = -x^3 + 2x^2 - 4x + 2}$.

x	**-3**	**-2**	**-1**	**0**	**1**	**2**	**3**	**4**
$-x^3$	27	8		0		-8		
$2x^2$	18	8	2	0				
-4x		8		0				-16
2	2	2	2	2	2	2	2	2
y		26		2		-6		-46

b) On the grid provided below draw the graph of $\mathbf{-x^3 + 2x^2 - 4x + 2}$ for $\mathbf{-3 \leq x \leq 4}$.
c) Use the graph to solve the equation $\mathbf{-x^3 + 2x^2 - 4x + 2 = 0}$.
d) By drawing a suitable line on the graph solve the equation. $\mathbf{-x^3 + 2x^2 - 5x + 3 = 0.}$

20. Determine the turning point of the curve $y = 4x^3 - 12x + 1$. State whether the turning point is a maximum or a minimum point.

21. (a) Complete the table below for the equation of the curve given by $\mathbf{y = 2x^3 - 3x^2 + 1}$

X	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2	2.5	3
$\mathbf{2x^3}$	-16		-2		0		2		16		
$\mathbf{-3x^2}$	-12			0.75	0	-0.75					-27
1	1				1						
y	-27	-12.5			1						13.5

(b) Use the table to draw the graph of the function $\mathbf{y = 2x^3 - 3x^2 + 1}$
c) Use your graph to find the values of x for :-
(i) $y > 0$
(ii) The roots of the equation $2x^3 - 3x^2 + 1 = 0$
(iii) $2x^3 - 3x^2 = 9$

22. Find the radius and the centre of a circle whose equation is :

$2x^2 + 2y^2 - 6x + 10y + 9 = 0$