b) Find the equation of a circle whose center lies on the line $y = 3x - 1$ and passes through the points $(1, 1)$ and $(2, -1)$. (7 marks)

11a) Sketch the curve $y = 2x^3 - 3x^2$, stating the intercepts and the turning point. (8 marks)

b) Find the volume of the solid generated when the area enclosed by the curve and the $x-$axis is rotated through 360^o about the $x-$ axis. (4 marks)

12a) Solve: $4\sin^4 x + \sin^2 2x - 35\cos^4 x = 0$, for $0^o \le x \le 180^o$ (6 marks)

b) Prove that $\tan 3\theta = \dfrac{3\tan\theta - \tan^3\theta}{1 - 3\tan^2\theta}$, hence solve $t^3 - 3t^2 - 3t + 1 = 0$. (6 marks)

13a) Find a vector which is normal to the vector $\mathbf{a} = -5\mathbf{i} - \mathbf{j} - \mathbf{k}$ and $\mathbf{b} = 4\mathbf{i} + 2\mathbf{j} - 3\mathbf{k}$. (6 marks)

b) A line AB passes through points $A(2, 4, 2)$ and $B(4, -3, 3)$. Find the:

i) vector equation of line AB.

ii) acute angle between line AB and the vector $\mathbf{c} = 5\mathbf{i} + 3\mathbf{k}$. (6 marks)

14a) A circle is divided into 10 sectors. The sizes of the angles of the sectors are in an arithmetic progression, the angle of the largest sector is Seven times the angle of the smallest sector. Find the difference between the largest and smallest angle. (6 marks)

b) Prove by mathematical induction that: $\dfrac{1}{2} + \dfrac{1}{2^2} + \dfrac{1}{2^3} + \ldots + \dfrac{1}{2^n} = 1 - \dfrac{1}{2^n}$. (6 marks)

15. Express in partial fractions: $\dfrac{18 - 19x}{(1 - x)(2 - 3x)}$ and hence find the binomial expansion up to and including the term in x^3. (12 marks)