1. If ω is cube root of unity , show that
   (a) $(1-\omega-\omega^2)^5 + (1+\omega-\omega^2)^5 = 32$
   (b) $(1+ \omega) (1 + \omega^2)(1+ \omega^4)(1+ \omega^8)$ to 100 factors is equal to 1

2. (a) Solve : $2x - 1 = 3 + \frac{2}{x-2}$

   (b) If (b – c) $x^2 + (c – a) x + (a- b) = 0$ *has equal roots show that* $2b = (a+ c)$
   (c) If α, β are the roots of the equation $x^2- p(x+1)- c = 0$ *show that* (α+1) (β+1) = 1-*c*

3. (a) Show that $2tan^{-1}x = cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)$
   (b) From the top of a cliff 300 metres high the top of a tower was observed at an angle of depression 30^0 and from the foot of the tower the top of the cliff was observed at an angle of 45^0. Find the height of the tower and also the distance between the tower and the cliff.

4. (a) R is the set of real numbers and f: R→R and g: R→R are defined as $f(x) = 3x^2+2$ and g(x) = 3x-1 for all x∈R. Find the composite function fog and gof from R →R
   (b) f: R→R is defined by $f(x) = x^2$ for all x∈R. Given Є >0 find aδ > 0 to show that f is continuous at x=2

5. (a) if $y = \sqrt{xlog_e x}$ and $\frac{dy}{dx}$ at x=e
   (b) if $x^3 = e^{x-y}$ determine $\frac{dy}{dx}$ in terms of x

6. (a) Integrate $\frac{x}{x^4-x^2+1}$ $with\ respect\ to\ x$
   (b) Evaluate $\int_0^{1/\sqrt{2}} \frac{sin^{-1}x}{(1-x^2)\sqrt{1-x^2}} dx$

7. (a) Find the unit vector perpendicular to each of the vectors $2\hat{\imath} - \hat{\jmath} + \hat{k}$ and $3\hat{\imath} - 4\hat{\jmath} - \hat{k}$
   (b) For any vector $\vec{a}$ show that $\hat{\imath} \times (\vec{a} \times \hat{\imath}) + \hat{\jmath} \times (\vec{a} \times \hat{\jmath}) + \hat{k} \times (\vec{a} \times \hat{k})$ $is\ equal\ to\ 2\vec{a}$

8. (a) Show that $3x^2+ 4y^2-6x+8y-5=0$ represents an elipse and determine its centre, foci and eccentricity.
   (b) Find the equations of the tangent and normal at (a, -2a) to the parabola $y^2= 4ax$

9. (a) The resultant of two forces P and Q acting at a point at angle α is ((2m+1)$\sqrt{(P^2+Q^2)}$ and when the angle between them is made $\frac{\pi}{2} - \alpha$ *the resultant becomes* (2m-1)$\sqrt{(P^2+Q^2)}$

   (b) A particle is projected vertically upwards with a velocity u m/sec and after t seconds another particle is projected upwards from the same point and with the same velocity. Find the time for the two particles to meet.

10. (a) A and B are two candidates seeking admission into course. The probability that A is selected is 0.6 and the probability that both A and B are selected is at most 0.3 is it possible that the probability of B getting selected is $\frac{3}{4}$? Why?

    (b) Find the variance of the distribution of 300 telephone calls according to their duration in seconds given below :

Duration (in seconds)	0-30	30-60	60-90	90-120	120-150	150-180
No.of calls	13	21	47	86	35	48