1. (a) Let z = x + iy , where x, y are variables. Prove that if $2|z-1| = |z-2|$ then $3(x^2+y^2) = 4x$.
   (b) Find the three cube roots of unity.

2. (a) If α and β are the roots of $5x^2 - 20x + 12 = 0$ then the value of $\alpha^3 + \beta^3$ is$35\frac{1}{5}$
   (b) show that the function $\frac{x^2-x+1}{x-1}$ cannot take any value between -1 and 3 for any real value of x

3. (a) Show that $\tan^{-1} x + \cot^{-1} x = \frac{\pi}{2} for -\infty < x < \infty$
   (b) When the elevation of the sun is 30^0, show that the length of the shadow cast be a tower of 150 ft height Is $150\sqrt{3}$ ft.

4. (a) Prove that $\lim_{x\to\infty} \frac{2x^3-4x+7}{3x^3+5x^2-4} = \frac{2}{3}$
   (b) Show that $f(x) = \frac{e^{\frac{1}{x}}-1}{e^{\frac{1}{x}}+1}$ $when\ x \neq 0, f(0) = 0\ discontinuous\ at\ x = 0$

5. (a)If $x^y = e^{x-y}, show\ that\ \frac{dy}{dx} = \frac{logx}{(1+logx)^2}$
   (b) If $ax^2 + 2hxy + by = 1$, $prove\ that\ \frac{d^2y}{dx^2} = \frac{h^2-ab}{(hx+by)^2}$

6. (a) Evaluate $\int xlog(1+x)dx$
   (b) Prove that $\int_0^a f(x)\,dx = \int_0^a f(a-x)\,dx$

7. (a) Prove that necessary and sufficient condition that three non-parallel and non-null vectors be coplanar is $[\vec{a}, \vec{b}, \vec{c}]$ =0
   (b) If the tangents at two points P and Q on a parallel meet in T and S is the focus , prove that $ST^2 = SP.SQ$

8. (a) Prove that if three coplanar parallel forces be in equilibrium, each is proportional to the distance between the other two.
   (b) Show that the probability of getting head in a throw of a coin is ½.

9. (a) The equation of ellipse in the form $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ given the eccentricity to be $\frac{2}{3}$ and latus rectum $\frac{2}{3}$ is ….
   (b) The probability that a company executive will travel by train $\frac{2}{3}$ and that he will travel by is 1/5 . The probability of his travelling by train or plane is …
   (c) The hyperbola is the conic with eccentricity ….

10. (a) The resultant of two velocities u and au is bu and is at right angles to u. The $a^2 - b^2$=..
    (b) A relation f such that just one y corresponds to each x in the domain X is called a …
    (c) $(\vec{a} \times \vec{b}) \times \vec{c} = (\vec{c}.\vec{a}).\vec{b} - (\vec{c}.\vec{b}).\vec{a}$ is known as the ……. Triple product of three vectors $\vec{a}, \vec{b}$ *and* $\vec{c}$.