1. Let $f(x) = 1 - x - x^3$ Find all real values of x satisfying the inequality , $1 - f(x) - f^3(x) > f(1 - 5x)$

2. Integrate $\int \dfrac{e^{2x} - e^x + 1}{(e^x \sin x + \cos x)(e^x \cos x - \sin x)} dx$

3. The circle $C : x^2 + y^2 + kx + (1+k)y - (k+1) = 0$ passes through the same two points for every real number k. Find

   (a) the coordinates of these two points

   (b) the minimum value of the radius of a circle C.

4. Comment upon the nature of roots of the quadratic equation $x^2 + 2x = k + \displaystyle\int_0^1 |t + k| dt$ depending on the value of $k \in R$

5. Given $\displaystyle\lim_{n \to \infty} \left(\dfrac{^{3n}C_n}{^{2n}C_n} \right)^{1/n} = \dfrac{a}{b}$ where a and b are relatively prime, find the value of (a+b)