1. Expand $e^x \cos y$ at $(1, \frac{\pi}{4})$ using taylor series upto Second degree terms

2. Expand $f(x,y) = \tan^{-1} xy$ in ascending powers of $(x-1)$ & $(y-1)$ upto second degree terms.

3. Expand $e^x \log(1+y)$ in ascending powers of x & y upto third degree terms

4. Expand y^x upto second degree terms in the neighbourhood of the point $(1,1)$

5. Expand $\sin xy$ in powers of $x-1$ & $y-\frac{\pi}{2}$ upto Second terms using taylor's expansion

6. Find the extreme values of the function
$$f(x,y) = x^3y^2(1-x-y) \; ; \; x \neq 0, y \neq 0$$

7. Find all the points of maxima and minima of the function
$$f(x,y) = x^3+y^3-63(x+y)+12xy$$

8. Examine for maximum & minimum values of the function
$$f(x,y) = \sin x + \sin y + \sin(x+y)$$

9. The temperature T at any point (x,y,z) of the space is $T = 400xyz^2$. Find the highest temperature on the surface of the unit sphere $x^2+y^2+z^2=1$

10 Show that all triangles inscribed in a circle, the one with maximum area is equilateral.

11 Prove that if the Perimeter of a triangle is constant, its area is maximum, when triangle is equilateral

12 A rectangular box, open at the top is to have 32 cubic feet. Find the dimensions of the box requiring least material for its construction

13 Show that rectangular solid of maximum volume that can be inscribed in a given sphere is a cube

14 Find the shortest & longest distances from the point $(1,2,-1)$ to sphere $x^2+y^2+z^2=24$

15 Find the shortest distance between the line $y = 10-2x$ & the ellipse $\frac{x^2}{4}+\frac{y^2}{9}=1$