1.) Find the local maximum and minimum values and saddle points of the given function. $f(x,y) = 3xy - x^2y - xy^2$

3.) Find the all critical points for the following function and label them as local maximum and minimum values and saddle points accordingly where
$f(x,y) = 4xy - x^4 - y^4 + 1$

5.) Set up the integral and use it to find the volume in the first octant bounded by planes $x = 1$**,** $y = 2$**, and** $z = 3$

6.) Set up the integral and use it to find the volume in the first octant of the cylinder of radius 2 **with central axis the** z **axis and height** 2**.**

8.) Let S **be the plane** $S : x + 2y + 3z = 6$ **Find the volume of the plane in the first octant.**

9.) Set up the integral to find the volume inside the sphere $x^2 + y^2 + z^2 = 9$ **and outside the sphere** $x^2 + y^2 + z^2 = 1$**.**

10.) Find the volume inside the paraboloid $z = (x^2 + y^2)$ **and below the plane** $z = 1$**.**

II. Describe the solid whose region is given by the following integrals and then evaluate:

1. $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} dz\ dy\ dx$

2.) $\int_1^4 \int_{\sqrt{(y)}}^{y} \ln(y/x) dx dy$