

ESP  
Kouba  
Worksheet 3

1.) Sketch each of the following in three-dimensional space.

a.)  $x^2 - y^2 - z^2 = 0$

b.)  $x^2 - y^2 - z^2 = 1$

c.)  $x^2 + y^2 - z^2 = 0$

d.)  $x + \frac{y}{2} + \frac{z}{3} = 1$

2.) Sketch the solid bounded by the given surfaces in three-dimensional space.

a.)  $x=0, y=0, z=0, x=3, y=4, z=2$

b.)  $z = x^2 + y^2, z = 1 - y$

3.) Sketch the domain of each function.

a.)  $f(x, y) = \ln(1 + x + y)$

b.)  $f(x, y) = \frac{1}{\sqrt{9 - x^2 - y^2}}$

c.)  $f(x, y) = \sqrt{(x^2 - 4)(y^2 - 1)}$

4.) For each function  $f$  compute  $\Delta f$ , the exact change in  $f$ , and  $df$  (the differential), an approximate change in  $f$ .

a.)  $f(x,y) = x^2 y$ ,  $x: 2 \rightarrow 2.1$ ,  $y: 3 \rightarrow 3.3$

b.)  $f(x,y) = \sqrt{x+y^3}$ ,  $x=1$ ,  $y=2$ ,  $\Delta x = 0.01$ ,  $\Delta y = -0.02$

c.)  $f(x,y) = \frac{y}{e^x}$ ,  $(x,y): (0,3) \rightarrow (\ln 1.01, 2.9)$

5.) A right circular cylinder of radius  $r$  and height  $h$  is measured in such a way that  $r$  and  $h$  are computed with maximum absolute percentage errors of 2% and 3%, resp. What is the maximum absolute percentage <sup>error</sup> with which each of the following are computed? (Use differentials.)

a.) volume

b.) surface area

6.) The length, width, and height of a rectangular block are measured with maximum absolute percentage errors of 1%, 2%, and 4%, resp. Determine the maximum absolute percentage error in measuring each of the following. (Use differentials.)

a.) volume

b.) surface area