Spring 2020 Math 251

Week in Review 2

courtesy: Amy Austin

(covering sections 14.1, 14.3, 14.4)

1. Find and sketch the domain of the following functions.

   a.) $f(x,y) = \ln(y - 3x)$

   b.) $f(x,y) = \sqrt[4]{xy}$

   c.) $f(x,y) = \dfrac{\sqrt{8 - x^2 - y^2}}{x + 2y}$

2. Sketch several level curves for the following surfaces:

   a.) $f(x,y) = 2 + 4x - y$

   b.) $f(x,y) = x + y^2$

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

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

3. Describe the level surfaces of $f(x,y,z) = x + y + z$.

4. Describe the level surfaces of $f(x,y,z) = x^2 + y^2 + z^2$.

5. Find $f_x(-1,2)$ and $f_y(-1,2)$ for $f(x,y) = x^3 - y^4 - 6x^2y^3$

6. Find $f_x(x,y)$ and $f_y(x,y)$ for $f(x,y) = x^2 e^{\cos(2x^4y^2)}$

7. Find all higher order partial derivatives for $f(x,y) = \ln(2x + 3y)$

8. Find the equation of the tangent plane to the surface $z = x^3 - 3y^2$ at the point $(-1, 1, -4)$

9. Find the equation of the tangent plane to the surface $z = e^{x-y}$ at the point $(2, 2, 1)$. What is the equation of the normal line to this tangent plane the point $(2, 2, 1)$?

10. Find the differential of $z = e^{-2x}\sin(\pi y)$.

11. Use differentials to approximate $f(1.02, 0.97)$ for $f(x,y) = 1 - xy\cos(\pi y)$

12. The length and width of a rectangle are measured as 30 cm and 24 cm, respectively, with an error in measurement of 0.1 cm in both. Use differentials to approximate the maximum error in the calculated area of the rectangle.