MATH 3335
HOMEWORK # 5, DUE OCTOBER 11

PROFESSOR WAGNER

Do p. 112 1,3-5, 7-12, 14, 15, 22, 30, 31, 35-36. **Turn in 8, 22, 31**.
p. 117 Do 1-4. **Turn in 2**.
p. 124 1, 3-5, 7, 8, 10, 11. Turn in 4, 10, 11. **Show work!**

Turn in solutions to the following problems:

(1) Suppose $f(x, y, z)$ is continuously differentiable and that $\nabla f(3, 5, 7) \neq 0$. If the tangent plane to the surface $f(x, y, z) = f(3, 5, 7)$ has the equation

$$11(x - 3) + 13(y - 5) + 2(z - 7) = 0,$$

find:

    (a) $\dfrac{\partial z(x, y)}{\partial x}$ at $x = 3$, $y = 5$, where $z(x, y)$ is implicitly defined by the equation $f(x, y, z) = f(3, 5, 7)$.

    (b) $\dfrac{\partial x(y, z)}{\partial z}$ at $y = 5$, $z = 7$, where $x(y, z)$ is implicitly defined by the equation $f(x, y, z) = f(3, 5, 7)$.

(2) Consider the equation:

(1)
$$\frac{x^2}{3} = xy + 2yz + xz - 10.$$

    (a) Identify a function $f(x, y, z)$ for which (1) describes a level set.

    (b) Find $\nabla f(3, 1, 2)$ and find the equation of the tangent plane to (1) at $(3, 1, 2)$.

    (c) Let $z = g(x, y)$ be defined implicitly by (1) in a neighborhood of $(3, 1, 2)$. Find $\dfrac{\partial z}{\partial x}(3, 1)$.

    (d) Let $x = h(y, z)$ be defined implicitly by (1) in a neighborhood of $(3, 1, 2)$. Find $\dfrac{\partial x}{\partial y}(1, 2)$.