Practice for Quiz 7
Math 2580
Spring 2016

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If you can answer the following problems, you should be well-prepared for Quiz 7:

1. Find the equation of the tangent plane to the surface $x^2 + 2y^2 + 3xz = 10$ at the point $(1, 2, \frac{1}{3})$.

2. On Assignment 3 you're asked to derive the following formula: if $y = g(x)$ is a function satisfying the relation $F(x, y) = C$ for some constant C, then

$$\frac{dy}{dx} = g'(x) = -\frac{F_x(x, g(x))}{F_y(x, g(x))}.$$

   Use this result to find the slope of the tangent line to the curve $x^2 + y^4 = 5$ at the point $(2, 1)$.

3. Let $F(x, y, z) = xy^2 - x^2z + 2yz^2$, and suppose $z = g(x, y)$ satisfies the relation $F(x, y, z) = 1$. Use implicit differentiation to compute $g_x(1, 1)$ and $g_y(1, 1)$.

   Hint: Calculate the partial derivative of both sides of the equation $xy^2 - x^2z + 2yz^2 = 1$ with respect to both x and y, and keep in mind that z is assumed to be a function of x and y.

4. Suppose $\vec{n} = \langle a, b, c \rangle$ is the normal vector for the tangent plane at a point on surface in $\mathbb{R}^3$. What can you say about the values of a, b, and c if the plane is

   (a) Horizontal?

   (b) Vertical?

5. Find any points (a, b) at which the tangent plane to the surface $z = x^2 - 2x + y^2$ is horizontal.