Quiz 7

Name:

Problem 1 (5 points): Find the value of $\frac{\partial y}{\partial x}$ at the point $(1, 1, 2)$ if the equation

$$x^6 y + z \ln y - y^3 + 1 = 1$$

defines y as a function of the two independent variables x and z and the partial derivative exist.

$$6x^5 y + x^6 \frac{\partial y}{\partial x} + \frac{z}{y}\frac{\partial y}{\partial x} - 3y^2 \frac{\partial y}{\partial x} = 0$$

$$\frac{\partial y}{\partial x}\left(x^6 + \frac{z}{y} - 3y^2\right) = -6x^5 y$$

$$\frac{\partial y}{\partial x} = \frac{-6x^5 y}{x^6 + z/y - 3y^2}$$

$$\left.\frac{\partial y}{\partial x}\right|_{(1,1,2)} = \frac{-6(1)^5(1)}{1^6 + 2/1 - 3(1)^2} = \frac{-6}{1+2-3} = \frac{-6}{0}$$

$\boxed{\text{undefined}}$

Problem 2 (5 points): Find a vector parallel to the line of intersection of the planes $2x - 4y + 5z = 3$ and $-2z - 2x + 6y = 4$.

$n_1 = \langle 2, -4, 5 \rangle$

$n_2 = \langle -2, 6, -2 \rangle$

$$n_1 \times n_2 = \begin{vmatrix} i & j & k \\ 2 & -4 & 5 \\ -2 & 6 & -2 \end{vmatrix} = i \begin{vmatrix} -4 & 5 \\ 6 & -2 \end{vmatrix} - j \begin{vmatrix} 2 & 5 \\ -2 & -2 \end{vmatrix} + k \begin{vmatrix} 2 & -4 \\ -2 & 6 \end{vmatrix}$$

$$= i(8 - 30) - j(-4 + 10) + k(12 + 8)$$

$$= -22i - 6j + 20k$$

$$\boxed{\langle -22, -6, 20 \rangle}$$