Quiz 7 Solutions

Name:

Problem 1 (5 points): Find the value of $\frac{\partial x}{\partial y}$ at the point $(1, -1, 3)$ if the equation $y^7 x + z \ln x + x^3 - 1 = -1$ defines x as a function of the two independent variables y and z and the partial derivative exists.

$$\frac{\partial x}{\partial y}\left(y^7 x + z\ln x + x^3 - 1\right) = \frac{\partial x}{\partial y}(-1)$$
$$7y^6 x + y^7 \frac{\partial x}{\partial y} + \frac{z}{x}\frac{\partial x}{\partial y} + 3x^2 \frac{\partial x}{\partial y} = 0$$
$$7y^6 x + \frac{\partial x}{\partial y}\left(y^7 + \frac{z}{x} + 3x^2\right) = 0$$
$$\frac{\partial x}{\partial y}\left(y^7 + \frac{z}{x} + 3x^2\right) = -7y^6 x$$
$$\frac{\partial x}{\partial y} = \frac{-7y^6 x}{y^7 + \frac{z}{x} + 3x^2}$$
$$\frac{\partial x}{\partial y}(1, -1, 3) = \frac{-7(-1)^6 1}{(-1)^7 + \frac{3}{1} + 3(1)^2} = \frac{-7}{-1+3+3} = -\frac{7}{5}$$

Problem 2 (5 points): Find a vector parallel to the line of intersection of the planes $-4x - 5z - 2y = 14$ and $2x + 3y + 3z = 1$.

$(-4i - 5j - 2k) \times (2i + 3j + 3k) = -8i^2 - 12ij - 12ik - 10ji - 15j^2 - 15jk - 4ki - 6kj - 6k^2 = -12k + 12j + 10k - 15i - 4j + 6i = -9i + 8j - 2k$

$$\begin{vmatrix} i & j & k \\ -4 & -5 & -2 \\ 2 & 3 & 3 \end{vmatrix} = i\left(-15+6\right) + j\left(-12+4\right) + k\left(-12+10\right) = -9i - 8j - 2k$$