Worksheets
9/21/2017

1. Let $f(x, y, z) = xy^2z^3$. Compute the following partial derivatives

$$\frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}, \frac{\partial f}{\partial z}, \frac{\partial^2 f}{\partial x \partial y}, \frac{\partial^2 f}{\partial z^2}.$$

2. With the function f given above, find

$$\frac{\partial f}{\partial x}(1, 2, -1)$$

in two ways: (1) plugging the numbers into the function found in the previous problem, (2) using limit definition.

3. Let

$$A = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & 1 \\ 3 & -1 & 2 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & 1 \\ 2 & 3 \\ 1 & 0 \end{bmatrix}, \quad v = \begin{bmatrix} -1 \\ 2 \end{bmatrix}$$

Compute AB, BA, and Bv.

4. Given four points A(1,0,1), B(2,1,1), C(2,3,0) and D(0,-1,2). Find the volume of the parallelepiped of which A, B, C, D are vertices such that A is adjacent to B, C, D.

5. Write the parametric equation of the line which is the intersection of the planes $x+2y+z=0$ and $2x-y=1$.

6. Find the area of the quadrilateral whose vertices are A(1,1), B(3,0), C(4,3) and D(1,2).

7. Indicate whether each of the following maps is a linear map from $\mathbb{R}^2$ to $\mathbb{R}^2$. If a map is linear, find the matrix associate with it.

   (a) $f(x, y) = (x, x + y)$

   (b) $g(x, y) = (xy, 0)$

   (c) $h(x, y) = (y - x, x, y)$

   (d) $k(x, y) = (0, 0)$

8. (Just for fun!) Is there a linear map from $\mathbb{R}^2$ to $\mathbb{R}^2$ which maps a rectangle to a circle?