

MATH 105A and 110A Review: Partial derivatives, finding the gradient and Jacobian matrix

Facts to Know:

Let $f : \mathbb{R}^m \rightarrow \mathbb{R}$, then gradient of

$$\nabla f =$$

Let $F : \mathbb{R}^m \rightarrow \mathbb{R}^n$ and let

$$F(x_1, \dots, x_m) =$$

where $f_i : \mathbb{R}^m \rightarrow \mathbb{R}$. Then the Jacobian matrix of F is the $n \times m$:

$$\nabla F =$$

Examples:

1. Find the gradient of $f(x, y, z) = xy^2$.

2. Find the Jacobian matrix of $F(x, y, z) = (xy, yz, xyz)$ at the point $(1, 2, 3)$.

3. Find the Jacobian matrix of $F(x, y, z) = (x^2 + y, y - z)$.