MATH 112A Review: Laplace and Polar Coordinates

Facts to Know:

Check out the Prerequiste Materials for Math 2E on partial derivatives (video 3):

`https://www.math.uci.edu/~prerequisite-videos/2e.html`

(2 D) Let $f : \mathbb{R}^2 \to \mathbb{R}$. The Laplace operator is

$$\Delta f =$$

(polar coordinates) Let $x = r\cos\theta$ and $y = r\sin\theta$. Let $g(r,\theta) = f(r\cos\theta, r\sin\theta)$. Then,

$$\Delta f(x,y)|_{(r\cos\theta, r\sin\theta)} =$$

(3 D) Let $f : \mathbb{R}^3 \to \mathbb{R}$. The Laplace operator is

$$\Delta f =$$

Examples:

1. Let $f(x,y) = xy^2$. What is Δf?

2. Let $f(x,y) = \sqrt{x^2+y^2}$. What is Δf in polar coordinates?