Math 367 – Tutorial #1

Matthew Greenberg and Keira Gunn

September 14-16, 2021

1. Evaluate z_x and z_y, where:
   (a) $z = xe^{x^2+y^2}$
   (b) $z = \cos(e^{x^2y^3})$
   (c) $xy^2 + yz^2 + xyz = 1$
   (d) $z = x^y$

2. Let
$$f(\mathbf{x}) = \|\mathbf{x}\|^r, \quad \mathbf{x} \in \mathbb{R}^n.$$
   Show that
$$\nabla f(\mathbf{x}) = r\|\mathbf{x}\|^{r-2}\mathbf{x}.$$

3. Let $y = f(\mathbf{x})$, $\mathbf{x} \in \mathbb{R}^n$. Show that
$$\nabla y^r = ry^{r-1}\nabla y.$$