

# Math 367 – Tutorial #1

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1. Evaluate  $z_x$  and  $z_y$ , where:

(a)  $z = xe^{x^2+y^2}$

(b)  $z = \cos(e^{x^2}y^3)$

(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

$$\nabla y^r = ry^{r-1}\nabla y.$$