

MATH 251: Practice 10

June 8, 2015

Name: Solutions

1. Compute the gradient of

$$f(x, y, z) = e^{xy} + 2xz^2 + \sin(yz)$$

$$\nabla f = \langle ye^{xy} + 2z^2, xe^{xy} + z \cos(yz), 4xz + y \cos(yz) \rangle$$

2. Find the directional derivative of  $f$  in the direction  $\langle 1, 1 \rangle$  at  $(-1, 2)$  for the function

$$f(x, y) = x^2 + 2y^2$$

$$\nabla f = \langle 2x, 4y \rangle \quad \nabla f|_{(-1, 2)} = \langle -2, 8 \rangle.$$

$$\nabla f \cdot \vec{v} = -2 \cdot 1 + 8 \cdot 1 = 6.$$

$$D_{\vec{v}} f = \frac{1}{\|\vec{v}\|} \nabla f \cdot \vec{v} = \frac{1}{\sqrt{2}} \cdot 6 = \boxed{\frac{6}{\sqrt{2}}} \\ = \boxed{3\sqrt{2}}$$