MTH 277, Quiz #11, Spring 2018 Name KEY

Instructions: Show all work. Use exact answers unless otherwise asked to round.

1. Find the directional derivative on the surface $f(x,y) = \sin 2x \cos y$ at the point $(\pi, 0)$ in the direction of $\langle 1, -1 \rangle$.

$\nabla f = \langle 2\cos 2x \cos y, -\sin 2x \sin y \rangle$

$2\cos 2\pi \cdot \cos 0, -\sin(2\pi)\sin 0$

$= \langle 2 \cdot 1 \cdot 1, 0 \rangle = \langle 2, 0 \rangle$

$\vec{u} = \langle 1, -1 \rangle$

$\|\vec{u}\| = \sqrt{1^2 + (-1)^2} = \sqrt{2}$

$\vec{v} = \frac{\vec{u}}{\|\vec{u}\|}$

$\vec{v} = \langle \frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}} \rangle$

$\nabla f \cdot \vec{v} = \frac{2}{\sqrt{2}} + 0/\sqrt{2} = \boxed{\frac{2}{\sqrt{2}}}$

2. What is the maximum value of the directional derivative of $f(x,y,z) = xye^z$ at the point (4,3,1).

$\nabla f = \langle ye^z, xe^z, xye^z \rangle$

$= \langle 3e, 4e, 12e \rangle$

$\|\nabla f\| = \sqrt{(3e)^2 + (4e)^2 + (12e)^2} = \sqrt{9e^2 + 16e^2 + 144e^2} = \sqrt{169e^2}$

$= 13e$