Math 155A - Fall 2022 - Quiz #10 - October 27

Name: Answer Key

PID:

This "2" was omitted in the restated definition by mistake. Either answer was accepted.

1. A cone $\mathcal{C}$ is defined by $y = 2\sqrt{x^2 + z^2}$, so that it is centered around the positive y-axis. It can equivalently be defined as

$$\mathcal{C} = \{\langle y^2 = x^2 + z^2\rangle : y \geq 0\}.$$

Suppose $\langle x, y, z\rangle$ lies on $\mathcal{C}$. Give a formula for a normal vector (not necessarily a unit vector) at $\langle x, y, z\rangle$ on C. Choose the direction of the normal vector to point outward from the cone, i.e., away from the y-axis and somewhat downward.

Any positive multiple of:

$\langle x, -y, z\rangle$

or

$\langle 4x, -y, 4z\rangle$, possibly with y replaced by $2\sqrt{x^2+z^2}$

2. A parametric surface is defined by $\mathbf{f}(u, v) = \langle u, uv, v\rangle$. Give a formula for a normal vector at the point $\mathbf{f}(u, v)$. Your answer does not need to be a unit vector.

Answers: $\langle v, -1, u\rangle$ or any non-zero multiple

$\frac{\partial f}{\partial u} = \langle 1, v, 0\rangle$ $\quad$ $\frac{\partial f}{\partial v} = \langle 0, u, 1\rangle$