

MATH 251: Quiz 7

April 23, 2015

Name: _____ Sec: _____

1. Let $\mathcal{S} = G(u, v) = (u^2 + v^2, -v, u)$ be a parametrically defined surface, where u and v satisfy $u^2 + v^2 \leq 4$.

- (a) Compute $\vec{T}_u(u, v)$, $\vec{T}_v(u, v)$, and $\vec{n}(u, v)$ for this surface (as functions of u and v).
- (b) Find the equation for the tangent plane to \mathcal{S} at the point $(2, 0, 1) = G(1, 1)$.
- (c) Compute the surface area of \mathcal{S} .

2. Let $\vec{F} = \langle x + 3y^2, y + 4x, z \rangle$ be a vector field, and let \mathcal{S} be the plane defined by the equation $z = 6 - 2x - y$ for $1 \leq x \leq 3$ and $1 \leq y \leq 3$. Compute the flux of \vec{F} through \mathcal{S} , where \mathcal{S} is defined with the upward (positive z -direction) normal, i.e., find

$$\int_{\mathcal{S}} \vec{F} \cdot d\vec{S}.$$