Math 2401 (K1-K3)
04/13/2015

Worksheet 17 - Surface Integrals

1. Find $\iint_S y\,d\sigma$, where S is the surface $z = x + y^2$, $0 \le x \le 1$, $0 \le y \le 2$ (pictured in Figure 1). Try to use both methods (implicit and parametrized).

2. Find $\iint_S (x^2 z + y^2 z)\,d\sigma$, where S is the upper hemishphere: $x^2 + y^2 + z^2 = 4$; $z \ge 0$.

3. Find the surface area of the portion of the sphere $x^2 + y^2 + z^2 = 16$ that remains after removing its spherical caps that lie inside the cylinder $x^2 + z^2 = 12$.

4. Find $\iint_S y\,d\sigma$, where S is the portion of the cylinder $x^2 + y^2 = 3$ between the planes $z = 0$ and $z = 6$.

5. Find $\iint_S x^2 yz\,d\sigma$, where S is the portion of the plane $z = 1 + 2x + 3y$ that lies above $0 \le x \le 3$ and $0 \le y \le 2$ - see Figure 2.

6. Find $\iint_S (y + z)\,d\sigma$, where S is the closed surface whose sides are given by the cylinder $x^2 + y^2 = 3$, whose top lies in the plane $z = 4 - y$, and whose bottom is in the xy-plane.

7. Find $\iint_S yz\,d\sigma$, where S is the surface parametrized by $x = uv$, $y = u+v$, $z = u-v$, where $u^2+v^2 \le 1$.

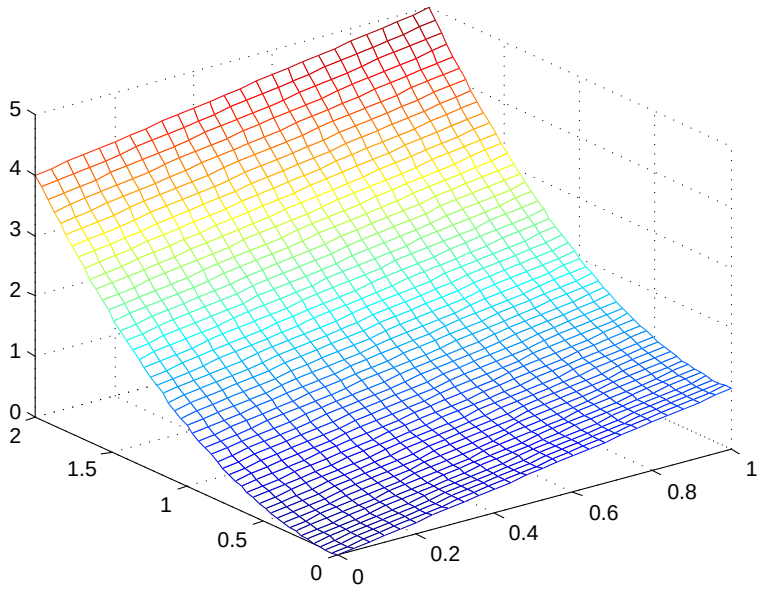

Figure 1: The surface $z = x + y^2$, $0 \leq x \leq 1$, $0 \leq y \leq 2$.

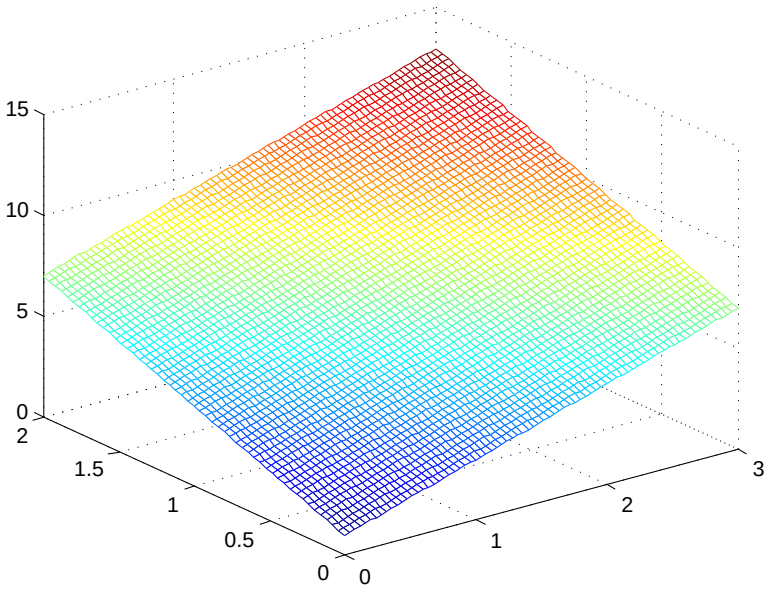

Figure 2: The portion of the plane $z = 1 + 2x + 3y$ that lies above $0 \leq x \leq 3$ and $0 \leq y \leq 2$.