

## Math 214 Hwk 12

**Problem 1.** Let  $C$  be the curve given by  $x(\theta) = 2 \cos \theta$  and  $y(\theta) = 2 \sin \theta$ , where  $\theta \in [0, 2\pi]$ . Compute the integral

$$\int_C (y - x)dx + (2x - y)dy.$$

**Problem 2.** Find the area of the region  $R$  bounded by the graphs

$$y = 2x + 1 \quad \text{and} \quad y = 4 - x^2.$$

**Problem 3.** Find the flux of  $F(x, y, z) = (3x, -4, y)$  through the surface  $S$ , where  $S$  is the boundary of the region bounded by the plane  $x + y + z = 1$  and the coordinate planes.

**Problem 4.** Let  $F(x, y, z) = (2z, x, y^2)$  and  $S$  be the surface of the paraboloid  $z = 4 - x^2 - y^2$  and  $C$  is the intersection of  $S$  with the  $xy$ -plane. Find

$$\int \int_S (\nabla \times F) \cdot \hat{n} dS.$$

**Problem 5.** Find the electric field produced by a straight infinite (in both directions) wire with a uniform charge density  $\lambda$ .