

MATH 2415 Test 5

Name: \_\_\_\_\_

**Solve two of the three test problems. To indicate which you want graded, circle two of these numbers: 1 2 3.**

1. Find the mass of  $\{(x, y, z) : 0 \leq \rho \leq 9 \text{ and } 0 \leq \phi \leq \pi/5\}$  assuming density  $dm/dV = z$ .

**2.** Let  $C$  be the curve  $\langle x, y \rangle = \langle 9 \cos t, 9 \sin t \rangle$  for  $t \in [0, 2\pi]$ . Let  $\langle P, Q \rangle = \langle x^2 y^4, x^6 y^6 \rangle$ . Use Green's Theorem to express  $\int_C (P dx + Q dy)$  as an iterated double integral ( $\int_{\square}^{\square} \int_{\square}^{\square} \square d\square$ ). Only two variables should appear in your final answer:  $x$  and  $y$  if you choose Cartesian coordinates;  $r$  and  $\theta$  if you choose polar coordinates. (You do not need to evaluate your double integral.)

**3.** Let  $D$  be the half plane  $\{(x, y) : 3x + 8y + 1 > 0\}$ . (Note that  $D$  contains the point  $(0, 0)$ .) Let

$$\vec{F} = \langle (8y + 1)(3x + 8y + 1)^{-2}, -8x(3x + 8y + 1)^{-2} \rangle.$$

Find  $g$  such that  $\vec{F} = \nabla g$  on  $D$ . (You don't need to check that  $\text{curl } \vec{F} = 0$ ; trust me that it does.)