

## M427L Summer 2011 Final Exam

Name \_\_\_\_\_

NO NOTES. NO CALCULATORS.

1. Evaluate  $\int_0^2 \int_x^2 2y^2 \sin(xy) \, dy \, dx$ .

2. Find the largest product the positive numbers  $x$ ,  $y$ , and  $z$  can have if  $x + y + z^2 = 16$ .

3. Evaluate  $\iint_{\mathcal{S}} yz \, dS$ , where  $\mathcal{S}$  is the part of the plane  $x + y + z = 3$  in the 1st Octant.

4. Let  $R$  be the region bounded by  $0 \leq x \leq \pi$ ,  $0 \leq y \leq \sin x$ . Evaluate  $\oint_{\mathcal{C}} 3y \, dx + 2x \, dy$  where  $\mathcal{C}$  is the boundary of  $R$ , oriented counter-clockwise.

5. Let  $\mathbf{F}(x, y, z) = 2y\mathbf{i} + 3z\mathbf{j} + 4x\mathbf{k}$  and  $\mathcal{S}$  be the part of the surface  $z = 9 - x^2 - y^2$  that lies above  $z = 5$ , oriented upward. Use Stokes' Theorem to evaluate  $\iint_{\mathcal{S}} (\nabla \times \mathbf{F}) \bullet d\mathbf{S}$ .

6. Evaluate  $\int_{(0,2,1)}^{(1,\pi/2,2)} 2 \cos y \, dx + \left( \frac{1}{y} - 2x \sin y \right) \, dy + \frac{1}{z} \, dz$ .

7. Let  $\mathbf{F} = (\sin(yz) + x^3)\mathbf{i} + (3z^2y + e^x)\mathbf{j} + 3zy^2\mathbf{k}$  and let  $W$  the solid region below  $x^2 + y^2 + z^2 = 1$  and above  $z$ . Find the flux of  $\mathbf{F}$  outward across the surface of  $W$ .

8. Find the area inside the loop of the curve  $x = t^2 - 3$ ,  $y = (t^3/3) - t$ .