Math 251 Practice Test 1.2 Spring 2002

Name: _____ ID #: _____

SCIENTIFIC CALCULATORS ONLY

1. [10 points] Prove that $||\mathbf{u} \times \mathbf{v}|| = ||\mathbf{u}||\,||\mathbf{v}|| \sin\theta$, where θ is the angle between $\mathbf{u}$ and $\mathbf{v}$.

2. [10 points] Find the volume of the parallelepiped with adjacent sides given by the vectors $\langle 1, 0, 1\rangle$, $\langle 1, 0, 0\rangle$, and $\langle 1, 1, 1\rangle$.

3. [10 points] Find the distance between the point $Q(1, 5, -4)$ and the plane given by $3x - y + 2z = 6$.

4. [10 points] Classify and sketch the surface given by $4x^2 - 3y^2 + 12z^2 + 12 = 0$.

5. [10 points] Consider the parametric equations $x(t) = 2\sin^2 t$ and $y(t) = 2\cos^2 t$.

   a) Graph the curve for all values of t.

   b) What is the curvature at $t = 0$?

6. [10 points] The acceleration vector of a particle is $\mathbf{a}(t) = \langle 1, t, e^t\rangle$, with units in meters/second squared. Set up an integral to find how far the particle travels in 10 seconds. Do not solve it.

7. [10 points] Let $f(x, y, z) = \sin(yx) + \cos(xyz) + x^2y^3e^z$. Show directly that $f_{xz} = f_{zx}$.

8. [10 points] Sketch the level curves of $z = e^{xy}$ for $z = 0$, 1, and 2.

9. [10 points] Find an equation for the line going through $(1, -2, 3)$ and $(7, 2, 1)$.

10. [10 points] Do the integral $\int x \sin x\, dx$.