MA 227: CALCULUS II
MIDTERM TEST #1, SEPTEMBER 15, 2005

Time limit: 105 min.

Your name (print):

Your signature:

1. At what point(s) does the curve

$$\vec{r}(t) = \langle t + 3,\ 5t^2 + 14t + 26,\ 2t \rangle$$

intersect the paraboloid $y = 2x^2 + z^2$?

10 points

2. Find a parametric equation for the tangent line to the curve

$$\vec{r}(t) = \langle \sin t,\ t^2,\ \cos t \rangle$$

at the point $P(1,\ \pi^2/4,\ 0)$.

10 points

3. Find the curvature of the space curve

$$\vec{r}(t) = t\vec{i} + t\vec{j} + (1 + t^2)\vec{k}$$

at any point.

10 points

4. Find the vectors $\vec{T}(t)$, $\vec{N}(t)$, and $\vec{B}(t)$ for the curve

$$\vec{r}(t) = \langle 4t,\ 3\cos t,\ -3\sin t \rangle.$$

10 points

5. Find the velocity, acceleration, and speed of a particle with the position function

$$\vec{r}(t) = \langle t^2,\ t\cos t,\ t\sin t\rangle.$$

10 points

6. Classify the surface

$$y^2 - 2z^2 - x + 6y + 8z + 2 = 0.$$

10 points

7. Describe the level surfaces of the function

$$f(x, y, z) = 3x^2 + 5y^2 - 2z + 7.$$

10 points

8. Classify the level surfaces of the function

$$f(x, y, z) = yz + 1.$$

10 points

9. Calculate the limit

$$\lim_{(x,y)\to(0,0)} \frac{x^2 + y^2}{x^2 + xy + y^2}.$$

10 points

10. Calculate the limit

$$\lim_{(x,y)\to(0,0)} \frac{x^2 y}{x^2 + xy + y^2}.$$

10 points