MA 227: Calculus III
Test #1, February 12, 2004

Time allotted: 105 min.

Your name:

Sign here:

1. Let $r(t) = \langle 3t^2,\, 2t - 1,\, 2t^3 \rangle$. Find a parametric equation for the tangent line to the above curve at the point $\langle 3,\, -3,\, -2 \rangle$.

10 points

2. Find the curvature of the space curve $r(t) = \langle t,\, 3t^2,\, t^3 \rangle$ at the point $(-1, 3, -1)$.

10 points

3. Let $r(t) = \langle 3t,\, 2\cos t,\, \sin t\rangle$. Find the tangential and normal components of the acceleration (i. e. a_T and a_N) at the point $\langle 3\pi,\, -2,\, 0\rangle$.

10 points

4. Calculate the limit

$$\lim_{(x,y)\to(0,4)} \frac{x^2 y}{1-\cos x}.$$

10 points

5. Find $\partial z/\partial x$ and $\partial z/\partial y$ if

$$5x^2 - y^2 + z^2 = x(y - z).$$

10 points

6. Find the velocity, acceleration, and the speed of the particle with the position function $\vec{r}(t) = \langle e^{2t},\, 2\sin 3t,\, t^2 \rangle$.

10 points

7. Describe the level surfaces of the function $f(x, y, z) = x^2 + y^2 - 5z^2 - 4x + 2y$.

10 points

8. Determine the largest set on which the function

$$f(x, y) = \frac{1}{x^2 - y^2 + 2x - 2y}$$

is continuous.

10 points