

MA 227: Calculus III
Midterm Test #1, September 20, 2001

Time limit: 90 min.

Your name:

Your student ID:

1. Find a vector function $\vec{r}(t)$ that represents the curve of intersection of the surfaces $x^2 - y^2 = 1$ and $x + y + z = 2$. (Take care of both branches!)

10 points

2. Find a parametric equation for the tangent line to the previous curve at the point $P(-1, 0, 3)$.

10 points

3. Find the curvature of the curve $\vec{r}(t) = \cos t \vec{i} + \cos t \vec{j} + 2 \sin t \vec{k}$ at the point $P(1, 1, 0)$.

10 points

4. Find the vectors T , N , and B for the curve of problem 3 at the given point.

10 points

5. Find the tangential and normal components of the acceleration vector for the curve $\vec{r}(t) = t\vec{i} + t^2\vec{j} + 3t\vec{k}$ at the generic point $\vec{r}(t)$.

10 points

6. The motion $\vec{r}(t)$ takes place for positive time (always $t > 0$), $\vec{a}(t) = t\vec{i} - t\vec{j} - \frac{1}{t^2}\vec{k}$, $\vec{v}(1) = \frac{1}{2}(\vec{i} - \vec{j}) + \vec{k}$, $\vec{r}(1) = \frac{1}{6}(\vec{i} - \vec{j})$. Compute $\vec{r}(t)$.

10 points

7. Describe the level curves of the function $f(x, y) = x^2y^2 - 10xy$. Also, give the name of these curves.

10 points

8. Compute

$$\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 + y^2}{\ln(1 - x^2 - y^2)}.$$

10 points