

ANALYTIC GEOMETRY AND CALCULUS III

Exam II

March 9, 1995

The point value of each problem is indicated in the left margin. You must show all of your work for full credit. Points will be deducted for faulty reasoning, for sloppy notation, and for failure to simplify answers, even if your answer is correct. You may use a calculator, your class notes, and any reference material. Explicitly cite, in some manner, any published formulae you use.

The first seven problems refer to the curve

$$\mathbf{r} = (t, t^2, 1) \quad \text{for } 0 \leq t \leq 1.$$

(10) 1. What is its velocity?

Answer $\mathbf{v} =$ _____

(10) 2. What is its speed?

Answer $\nu =$ _____

(10) 3. What is its total length?

Answer $L =$ _____

(10) 4. What is its acceleration?

Answer $\mathbf{a} =$ _____

(10) 5. Compute $\mathbf{v} \times \mathbf{a}$.

Answer _____

(10) 6. What is its curvature?

Answer $\kappa =$ _____

(10) 7. What is its torsion?

Answer $\tau =$ _____

(10) 8. Show that $\lim_{(x,y) \rightarrow (0,0)} \frac{x-y}{|x-y|}$ does not exist.

(10) 9. Let $\mathbf{r}(1) = (1, 1)$, $\frac{d\mathbf{r}}{dt}(1) = (2, 3)$ and $f(x, y) = x^2y$. Find $\frac{d}{dt}(f \circ \mathbf{r})(1)$.

Answer _____

(10) 10. Calculate $\frac{\partial^2}{\partial x \partial y} (x^3y^2 + ye^x)$.

Answer _____