Georgia <u>State</u> University
(*This paper consists of   pages.*)

Test II   **Feb 26, 2003**   **Points: 91 & + is A**

Last name: _____ | **POINTS** |
First name: _____

You have a choice of problems ranked from 5 through 20 points. If your overall score exceeds 91 points your grade will be an "A".

Show all of your work. Calculators are not needed or permitted. Write neatly. Place answers in the space provided.

1 (15 points). Suppose $\mathbf{f}'(t) = (t\cos t)\mathbf{i} + \mathbf{j}/\sqrt{t}$ and $\mathbf{f}(0) = \mathbf{i}$. Find $\mathbf{f}(t)$

2 (20 points). The ellipse $x^2/9 + y^2/4$ can be written as $x = 3\cos t$ and $y = 2\sin t$. Find the equation of the line perpendicular to the ellipse at $t = \pi/4$.

3 (15 points). Find

$$\frac{d}{dt}\left[\left(\ln 2t\,\mathbf{i} + \frac{t^3}{3}\mathbf{j} - (t-1)\mathbf{k}\right) \times \left(\frac{1}{t^2}\mathbf{i} + t^2/2\,\mathbf{j} - 4\mathbf{k}\right)\right] \quad \text{at} \quad t = 0.$$

4 (20 points). Find the equation of the curve

$$\mathbf{r}(t) = (t^4 - t^2 + 1)\mathbf{i} + t^2\mathbf{j} \quad -2 \le t \le 2$$

in the (x,y) coordinates, sketch it and indicate its orientation.

5 (20 points). Find the length of the arc:

$$\mathbf{r}(t) = 3(\cos t + t \sin t)\mathbf{i} + 3(\sin t - t \cos t) \quad \text{from} \ \ t = 0 \ \ \text{to} \ \ t = \pi.$$

6 (30 points). Find the angle at an intersection/contact point of the two curves:

$$\mathbf{r_1}(t) = -2(\sin t)\mathbf{i} + (\cos t)\mathbf{j}$$

and

$$\mathbf{r_2}(u) = (-u^2 + 2)\mathbf{i} + \frac{2u}{3}\mathbf{j}$$

Hints: sketch the curves is very useful!

7 (Bonus 25 points). Find the point(s) on the curve in Problem 4 (page 4) that is the closest to
the point (0; 0.5)