

Name: \_\_\_\_\_

## Math 126E Midterm 2

11 May 2006

**Instructions:** You may use one two-sided sheet of notes on this exam. Scientific calculators are allowed, but not graphing calculators. Please turn off all cell phones and pagers. Show all work except where told otherwise.

- (8) 1. Find the length of the curve

$$\vec{r}(t) = \left\langle \frac{t^3}{3} - 7, \frac{\sqrt{6}}{2}t^2, 3t + 1 \right\rangle$$

for  $0 \leq t \leq 2$ .

- (8) 2. Find the equation of the tangent line (in the  $xy$ -plane) to the polar curve  $r = \cos(2\theta)$  at the point where  $\theta = \frac{\pi}{2}$ .

- (8) 3. Find an equation of the osculating circle to the graph of  $y = \cos(x)$  at the point  $(\frac{\pi}{4}, \frac{\sqrt{2}}{2})$ .

- (8) 4. The position function of a particle is given by

$$\vec{r}(t) = \langle t^2 + 3, 3t, t^2 - 12t \rangle.$$

When is the speed a minimum? Justify your answer.

- (8) 5. Let  $f(x, y) = y + x^2$ . Draw a contour map of  $f$  showing at least four level curves, including those at the values 1, -1, and 0. Label each level curve with its value.

6. Let  $f(x, y) = 2^{x^2 - \ln(x+y)}$ .

- (2) (a) Find the domain of  $f$ .
- (2) (b) Sketch the domain of  $f$ .
- (2) (c) Find the range of  $f$ .
- (2) (d) Evaluate  $f(0, e)$ .