## QUIZ 6 - MATH 251 YOUR NAME:

Read each problem **very carefully** before starting to solve it. Each problem is worth 5 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Let  $\mathbf{r}(t) = \langle \cos t, \sin t, t \rangle$ . Compute the following:

(a) r'(t) =

(b) r''(t) =

(c)  $\kappa(t) =$ 

(d) The radius of curvature at  $t = \pi$ .

(e) The center of curvature at  $t = \pi$ .

## 2. A particle has acceleration

$$\boldsymbol{a}(t) = 2t\boldsymbol{i} + \sin t\boldsymbol{j} + \cos 2t\boldsymbol{k},$$

where t is measured in seconds. Suppose that its initial velocity is v(0) = i and that its initial position is r(0) = j + k. Find the position of the particle at time  $t = \frac{\pi}{2}$  seconds into its orbit.

3. Find the (scalar) tangential component  $a_{\mathbf{T}}(t)$  of the acceleration vector for a particle whose position vector at time t is

$$\boldsymbol{r}(t) = e^t \boldsymbol{i} + \sqrt{2}t \boldsymbol{j} + e^{-t} \boldsymbol{k}.$$

Please, simplify your answer.