Name_____ ID_____

MATH 251   Quiz 2   Spring 2006

Sections 506   P. Yasskin

Total		/34

All Work Out: (2 points each, includes 9 points extra credit)

Consider the parametric curve with position vector $\vec{r} = \left(6t, 3\sqrt{2}\,t^2, 2t^3\right)$.
Compute each of the following:

1. velocity
   $$\vec{v} =$$

2. acceleration
   $$\vec{a} =$$

3. jerk
   $$\vec{j} =$$

4. length of velocity   Simplify. (Note the quantity in the square root is a perfect square.)
   $$|\vec{v}| =$$

5. speed
   $$\frac{ds}{dt} =$$

6. arclength between the points $(0,0,0)$ and $\left(6\sqrt{2}, 6\sqrt{2}, 4\sqrt{2}\right)$
   $$L =$$

7. unit tangent vector
   $$\hat{T} =$$

8. cross product of velocity and acceleration
   $$\vec{v} \times \vec{a} =$$

9. length of cross product of velocity and acceleration
   $$|\vec{v} \times \vec{a}| =$$

10. unit binormal

$\hat{B} =$

11. unit principal normal

$\hat{N} =$

12. curvature

$$\kappa = \frac{|\vec{v} \times \vec{a}|}{|\vec{v}|^3} =$$

13. torsion

$$\tau = \frac{\vec{v} \times \vec{a} \cdot \vec{j}}{|\vec{v} \times \vec{a}|^2} =$$

14. tangential acceleration   (use 2 methods)

$a_T = \vec{a} \cdot \hat{T} =$

15. $a_T = \dfrac{d}{ds}\dfrac{ds}{dt} =$

16. normal acceleration   (use 2 methods)

$a_N = \vec{a} \cdot \hat{N} =$

17. $a_N = \kappa|\vec{v}|^2 =$