Name_____   ID_____

MATH 251   Quiz 2   Fall 2005

Sections 503   P. Yasskin

Total	/34

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

Consider the parametric curve with position vector $\vec{r} = \left(t, t^2, \frac{2}{3}t^3\right)$.

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
    $\dfrac{ds}{dt} =$

6. arclength between the points $(0,0,0)$ and $\left(1,1,\frac{2}{3}\right)$
    $L =$

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
    $|\vec{v} \times \vec{a}| =$

1

10. unit binormal

$\hat{B} =$

11. unit principal normal

$\hat{N} =$

12. curvature

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

13. torsion

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

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