Name_____

MATH 251 Paper Homework 2 Spring 2010

Sections 200,511 P. Yasskin

Consider the curve $\vec{r}(t) = \left(e^t, \sqrt{2}\,t, e^{-t}\right)$. Compute each of the following. Show your work. Simplify where possible.

1. velocity
$\vec{v}(t) =$

2. acceleration
$\vec{a}(t) =$

3. jerk
$\vec{j}(t) =$

4. speed (HINT: The quantity in the square root is a perfect square.)
$|\vec{v}(t)| =$

5. arclength between $(1,0,1)$ and $\left(e, \sqrt{2}, \frac{1}{e}\right)$
$L =$

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

7. $\vec{v} \times \vec{a}$
$\vec{v} \times \vec{a} =$

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

9. unit binormal vector
$\vec{B} =$

10. unit normal vector

$\vec{N} =$

11. curvature

$\kappa =$

12. torsion

$\tau =$

13. tangential acceleration (compute in 2 ways)

$a_T =$

$a_T =$

14. normal acceleration (compute in 2 ways)

$a_N =$

$a_N =$

15. mass of a wire between $(1,0,1)$ and $\left(e, \sqrt{2}, \frac{1}{e}\right)$ with linear density $\rho = x - z$

$M =$

16. work to move a bead along the wire from $(1,0,1)$ to $\left(e, \sqrt{2}, \frac{1}{e}\right)$ with the force $\vec{F} = (z,y,x)$

$\vec{F}(\vec{r}(t)) =$

$W =$