Name_____ Section_____

MATH 221 Take Home Quiz 2 P. Yasskin

A) If your last name begins with A-F, consider the curve $\vec{r}(t) = (e^t\cos(t), e^t\sin(t), e^t)$.
B) If your last name begins with G-L, consider the curve $\vec{r}(t) = (3t^2, 4t^3, 3t^4)$.
C) If your last name begins with M-R, consider the curve $\vec{r}(t) = \left(e^t, \sqrt{2}\,t, e^{-t}\right)$.
D) If your last name begins with S-Z, consider the curve $\vec{r}(t) = (t^2, 2t, \ln(t))$.
E) Anyone may consider the curve $\vec{r}(t) = (\sinh(t), \cosh(t), t)$.
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 $t = 1$ and $t = 2$
$L =$

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

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

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

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 $t = 1$ and $t = 2$ with linear density $\rho = x$

$M =$

16. work to move a bead along the wire from $t = 1$ to $t = 2$.

For curves A and E, the force is $\vec{F} = (-y, x, 0)$. For curves B, C and D, the force is $\vec{F} = (0, y, x)$.

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

$W =$