Name_____

If your last name begins with A-F, consider the curve $\vec{r}(t) = (t^2, 2t, \ln(t))$.
If your last name begins with G-L, consider the curve $\vec{r}(t) = (\sinh(t), \cosh(t), t)$.
If your last name begins with M-R, consider the curve $\vec{r}(t) = (3t^2, 4t^3, 3t^4)$.
If your last name begins with S-Z, 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 $t = 1$ 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 $t = 2$ with the force $\vec{F} = (0, y, x)$
$$\vec{F}(\vec{r}(t)) =$$

$$W =$$