Find the derivative of the following fucntions.

A. $\mathbf{f}(t) = \langle e^{3t}, t^2 \tan t, \sqrt{t} \rangle$

B. $\mathbf{f}(t) = \langle \frac{t}{t^2+1}, \ln(t+4), 5 \rangle$

C. $\mathbf{f}(t) = \langle \frac{1}{t}, e^{t^2}, t\ln(t) \rangle$

Section 10.7

(5,6,10) Sketch the curve with the given vector equation. Indicate with an arrow the direction in which t increases.

5. $\mathbf{r}(t) = \langle \sin t, t \rangle$
6. $\mathbf{r}(t) = \langle t^3, t^2 \rangle$
10. $\mathbf{r}(t) = t^2\mathbf{i} = t\mathbf{j} + 2\mathbf{k}$

24. Show that the curve with parametric equations $x = \sin t$, $y = \cos t$, $z = \sin^2 t$, is the curve of intersection of the surfaces $z = x^2$ and $x^2+y^2 = 1$. Use this fact to help sketch the curve.
25. At what points does the curve $\mathbf{r}(t) = t\mathbf{i} + (2t - t^2)\mathbf{k}$ intersect the parabaloid $z = x^2 + y^2$?

(28,30) Find a vector function that represents the curve of intersection of the two surfaces.

28. The cylinder $x^2 + y^2 = 4$ and the surface $z = xy$
30. The paraboloid $z = 4x^2 + y^2$ and the parabolic cylinder $y = x^2$

59. Evaluate the integral
$$\int_0^{\pi/2} (3\sin^2 t \cos t\mathbf{i} + 3\sin t \cos^2 t\mathbf{j} + 2\sin t \cos t\mathbf{k})dt$$
63. Find $\mathbf{r}(t)$ if $\mathbf{r}'(t) = 2t\mathbf{i} + 3t^2\mathbf{j} + \sqrt{t}\mathbf{k}$ and $\mathbf{r}(1) = \mathbf{i} + \mathbf{j}$.