p. 870 (11.2)

Find the limit if it exists.

5. $\lim_{t\to 0}\left\langle t^2-1, e^{2t}, \sin t\right\rangle$

7. $\lim_{t\to 0}\left\langle \frac{\sin t}{t}, \cos t, \frac{t+1}{t-1}\right\rangle$

9. $\lim_{t\to 0}\left\langle \ln t, \sqrt{t^2+1}, t-3\right\rangle$

Determine all values of t at which the given vector-valued function is continuous.

11. $\vec{\mathrm{r}}(t)=\left\langle \frac{t+1}{t-1}, t^2, 2t\right\rangle$

Find the derivative of the given vector-valued function.

17. $\vec{\mathrm{r}}(t)=\left\langle t^4, \sqrt{t+1}, \frac{3}{t^2}\right\rangle$

19. $\vec{\mathrm{r}}(t)=\left\langle \sin t, \sin t^2, \cos t\right\rangle$

21. $\vec{\mathrm{r}}(t)=\left\langle e^{t^2}, t^2, \sec 2t\right\rangle$

Sketch the curve traced out by the endpoint of the given vector-valued function and plot the position and tangent vectors at the indicated points.

23. $\vec{\mathrm{r}}(t)=\left\langle \cos t, \sin t\right\rangle,\ t=0,\ t=\frac{\pi}{2},\ t=\pi$

25. $\vec{\mathrm{r}}(t)=\left\langle \cos t, t, \sin t\right\rangle,\ t=0,\ t=\frac{\pi}{2},\ t=\pi$

Evaluate the given indefinite or definite integral.

27. $\int\left\langle 3t-1, \sqrt{t}\right\rangle dt$

29. $\int\left\langle \cos 3t, \sin t, e^{4t}\right\rangle dt$

31. $\int\left\langle te^{t^2}, 3t\sin t, \frac{3t}{t^2+1}\right\rangle dt$

33. $\int_0^1\left\langle t^2-1, 3t\right\rangle dt$

Find t such that $\vec{\mathrm{r}}(t)$ and $\vec{\mathrm{r}}'(t)$ are perpendicular.

39. $\vec{\mathrm{r}}(t)=\left\langle t, t, t^2-1\right\rangle$

Find all values of t such that $\vec{r}'(t)$ lies on the xy-plane.

43. $\vec{r}(t) = \langle t, t, t^3 - 3 \rangle$

45. $\vec{r}(t) = \langle \cos t, \sin t, \sin 2t \rangle$

51. Label as true of false and explain why. If $\vec{u}(t) = \dfrac{1}{\|\vec{r}(t)\|}\vec{r}(t)$ and $\vec{u}(t) \cdot \vec{u}'(t) = 0$ then $\vec{r}(t) \cdot \vec{r}'(t) = 0$.

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