1–2 Find the domain of the vector function.

1. $\mathbf{r}(t) = \langle \sqrt{4 - t^2}, e^{-3t}, \ln(t + 1) \rangle$

3–6 Find the limit.

5. $\lim_{t \to 0} \left(e^{-3t}\mathbf{i} + \frac{t^2}{\sin^2 t}\mathbf{j} + \cos 2t\,\mathbf{k} \right)$

6. $\lim_{t \to \infty} \left\langle \arctan t, e^{-2t}, \frac{\ln t}{t} \right\rangle$

7–14 Sketch the curve with the given vector equation. Indicate with an arrow the direction in which t increases.

7. $\mathbf{r}(t) = \langle \sin t, t \rangle$

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

13. $\mathbf{r}(t) = t^2\mathbf{i} + t^4\mathbf{j} + t^6\mathbf{k}$

15–18 Find a vector equation and parametric equations for the line segment that joins P to Q.

17. $P(1, -1, 2)$, $Q(4, 1, 7)$

19–24 Match the parametric equations with the graphs (labeled I–VI). Give reasons for your choices.

19. $x = \cos 4t$, $y = t$, $z = \sin 4t$

20. $x = t$, $y = t^2$, $z = e^{-t}$

Figures on Page 2

21. $x = t$, $y = 1/(1 + t^2)$, $z = t^2$

22. $x = e^{-t}\cos 10t$, $y = e^{-t}\sin 10t$, $z = e^{-t}$

23. $x = \cos t$, $y = \sin t$, $z = \sin 5t$

24. $x = \cos t$, $y = \sin t$, $z = \ln t$

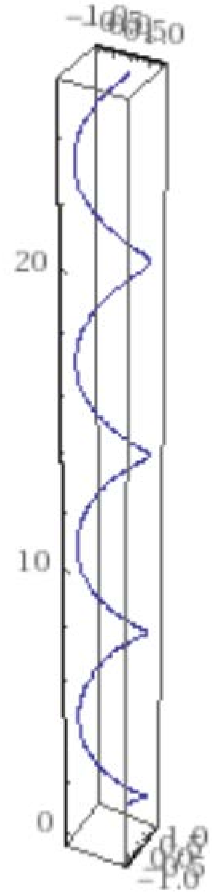
25. Show that the curve with parametric equations $x = t\cos t$, $y = t\sin t$, $z = t$ lies on the cone $z^2 = x^2 + y^2$, and use this fact to help sketch the curve.

27. At what points does the curve $\mathbf{r}(t) = t\,\mathbf{i} + (2t - t^2)\,\mathbf{k}$ intersect the paraboloid $z = x^2 + y^2$?

29–32 Use a computer to graph the curve with the given vector equation. Make sure you choose a parameter domain and viewpoints that reveal the true nature of the curve.

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

Don't panic if you don't have access to Computer Algebra System for #29. FYI and FWIW, I entered this into Wolframalpha.com: 3D parametric plot r(t)=<sin(t),cos(t),t> for t = 0 to 8*Pi



And it gave the plot seen on the right: