1. Match each function to one of figures 4-9 and state equations that graph to the surfaces in the figure.

\[ \vec{r}_1(t) = \langle \sin(t), 2\cos(t), \sin(t) + \cos(t) \rangle \]

\[ \vec{r}_2(t) = \langle \sec(t), \sin(t), 2\cos(t) \rangle \]

\[ \vec{r}_3(t) = \langle t + 2, t - 2, t^2 - 4 \rangle \]

\[ \vec{r}_4(t) = \langle t + 2, \frac{t^2}{2}, t^2 - 4 \rangle \]

\[ \vec{r}_5(t) = \langle 3\sin^2(t), 3\cos^2(t), 3\cos(2t) \rangle \]
Answers

\( \vec{r}_1 \left( t \right) = \left\langle \sin( t ), 2 \cos( t ), \sin( t ) + \cos( t ) \right\rangle \) is shown in Figure 8. The lighter surface is the plane \( z = x + \frac{y}{2} \) and the darker surface is the elliptical cylinder \( \frac{x^2}{1} + \frac{y^2}{4} = 1 \).

\( \vec{r}_2 \left( t \right) = \left\langle \sec( t ), \sin( t ), 2 \cos( t ) \right\rangle \) is shown in Figure 7. The darker surface is the hyperbolic cylinder \( z = \frac{2}{x} \) and the lighter surface is the elliptical cylinder \( y^2 + \frac{z^2}{4} = 1 \).

\( \vec{r}_3 \left( t \right) = \left\langle t + 2, t - 2, t^2 - 4 \right\rangle \) is shown in Figure 4. The lighter surface is the plane \( y = x - 4 \) and the darker surface is the hyperbolic paraboloid \( z = xy \).

\( \vec{r}_4 \left( t \right) = \left\langle t + 2, \frac{t^2}{2}, t^2 - 4 \right\rangle \) is shown in Figure 9. The lighter surface is the plane \( z = 2y - 4 \) and the darker surface is the parabolic cylinder \( y = \frac{(x - 2)^2}{2} \).

\( \vec{r}_5 \left( t \right) = \left\langle 3 \sin^2 \left( t \right), 3 \cos^2 \left( t \right), 3 \cos \left( 2t \right) \right\rangle \) is shown in Figure 6. The lighter surface is the plane \( z = 3 - 2x \) and the darker surface is the plane \( x + y = 3 \).

\[ \text{NOTE: } \sin^2 \left( t \right) = \frac{1 - \cos \left( 2t \right)}{2} \]