1 (10 pts). Sketch the graph of the vector-valued function \( \mathbf{r}(t) = (2 \sin t, t, 2 \cos t) \). Indicate with an arrow the direction in which the graph is traced by \( \mathbf{r} \) as \( t \) increases. It might help if you briefly describe the curve you’re trying to draw.

**Solution:** 1. (Source: 13.1.10) As \( t \) increases, the \( x \) and \( z \) coordinates are tracing a circle of radius 2, and the \( y \) coordinate is increasing at a constant speed. This describes a helix on the cylinder of radius 2, \( x^2 + z^2 = 4 \). Here’s a nice picture from Mathematica.

![Graph of vector-valued function](image)

As \( t \) increases, the curve is traced from left to right (that is, in the positive \( y \) direction).