1. An object moving with constant velocity passes through the point $(1, 1, 1)$, then through the point $(2, -1, 3)$ five seconds later. What is its velocity vector? What is its acceleration vector?

2. Suppose $\vec{\boldsymbol{r}}(t) = 3\cos(t)\,\hat{\boldsymbol{\imath}} + 3\sin(t)\,\hat{\boldsymbol{\jmath}} + 4t\,\hat{\boldsymbol{k}}$ represents the position of a particle on a curve after t seconds (with distance measured in meters).

   (a) Is the particle ever moving downward? If so, when?

   (b) When does the particle reach a point 12 meters above the ground?

   (c) What is the velocity of the particle when it is 12 meters above the ground? What is its speed?

   (d) When it is 12 meters above the ground, the particle leaves the curve and moves along the tangent line to the curve. Find an equation for this tangent line.