2.59. **Model:** Santa is a particle moving under constant-acceleration kinematic equations.  
**Visualize:** Note that our x-axis is positioned along the incline.

\[
\text{Pictorial representation}
\]

\[
\begin{align*}
\vec{v} & = v_0 + \vec{a}_g t \\
\vec{a}_g & = g \sin 30^\circ \\
& = 4.9 \text{ m/s}^2 \\
x_{f_1} & = 10 \text{ m}
\end{align*}
\]

\[
\text{Known}
\]

- \(x_0 = 0\)
- \(v_0 = 0\)
- \(t_0 = 0\)
- \(a_{y_g} = g \sin 30^\circ = 4.9 \text{ m/s}^2\)
- \(x_{f_1} = 10 \text{ m}\)

\[
\text{Find}
\]

- \(v_{f_1}\)

\[
\text{Physical representation}
\]

\[
\vec{v} = v_0 + \vec{a}_g t
\]

\[
v_{f_1}^2 = v_0^2 + 2a_g (x_{f_1} - x_0) = (0 \text{ m/s})^2 + 2(4.9 \text{ m/s}^2)(10 \text{ m} - 0 \text{ m}) \Rightarrow v_{f_1} = 9.9 \text{ m/s}
\]

**Assess:** Santa’s speed of 20 mph as he reaches the edge is reasonable.