Given: A ball is thrown straight up at a speed of 100 ft/sec.

Release height is 5 ft above the ground. Neglect air resistance.

Find:   a) Maximum height reached by the ball
        b) Time required to hit the ground

\[ x = \frac{1}{2} at^2 + Vo t + X_0 \]
\[ a = -g = -32.20 \text{ ft/sec}^2 \]
\[ V_0 = 100 \text{ ft/sec} \]
\[ X_0 = 5 \text{ ft} \]

\[ x(t) = \frac{1}{2} (32.20) t^2 + 100 t + 5 \]
\[ V(t) = -32.20 t + 100 \]

Maximum height is reached when \( V = 0 \)

\[ -32.20 t + 100 = 0 \]
\[ t = \frac{100}{32.20} = 3.11 \text{ sec} \]
\[ x(3.11) = -\frac{1}{2} (32.20) (3.11)^2 + 100 (3.11) + 5 \]
\[ = -155.3 + 311 + 5 = 161 \text{ ft} \]

Ball hits the ground when \( x = 0 \)

\[ 0 = -\frac{1}{2} (32.20) t^2 + 100 t + 5 \]
\[ t = -100 \pm \sqrt{100^2 + 4 \times 161 \times 5} \]
\[ = -100 \pm \sqrt{10160} \]
\[ = -32.2 \]

\[ t = \frac{-100 \pm 101.6}{-32.2} = 6.26 \text{ sec or } -0.05 \text{ sec} \]

Choose positive solution \( t = 6.26 \text{ sec} \)
\[ t := 0, 0.01..6.3 \quad x(t) := \frac{-1}{2} \cdot 32.20 \cdot t^2 + 100 \cdot t + 5 \]