23. We adopt the positive direction choices used in the textbook so that equations such as Eq. 4-22 are directly applicable. The coordinate origin is throwing point (the stone's initial position). The $x$ component of its initial velocity is given by $v_{0x} = v_0 \cos\theta_0$ and the $y$ component is given by $v_{0y} = v_0 \sin\theta_0$, where $v_0 = 20$ m/s is the initial speed and $\theta_0 = 40.0^\circ$ is the launch angle.

(a) At $t = 1.10\,\text{s}$, its $x$ coordinate is

$$x = v_0 t \cos\theta_0 = (20.0\,\text{m/s})(1.10\,\text{s})\cos 40.0^\circ = 16.9\,\text{m}$$

(b) Its $y$ coordinate at that instant is

$$y = v_0 t \sin\theta_0 - \frac{1}{2}gt^2 = (20.0\,\text{m/s})(1.10\,\text{s})\sin 40^\circ - \frac{1}{2}(9.80\,\text{m/s}^2)(1.10\,\text{s})^2 = 8.21\,\text{m}\,.$$

(c) At $t' = 1.80\,\text{s}$, its $x$ coordinate is

$$x = (20.0\,\text{m/s})(1.80\,\text{s})\cos 40.0^\circ = 27.6\,\text{m}$$

(d) Its $y$ coordinate at $t'$ is

$$y = (20.0\,\text{m/s})(1.80\,\text{s})\sin 40^\circ - \frac{1}{2}\left(9.80\,\text{m/s}^2\right)(1.80\,\text{s})^2 = 7.26\ \text{m}\ .$$

(e) and (f) The stone hits the ground earlier than $t = 5.0\,\text{s}$. To find the time when it hits the ground solve $y = v_0 t \sin\theta_0 - \frac{1}{2}gt^2 = 0$ for $t$. We find

$$t = \frac{2v_0}{g}\sin\theta_0 = \frac{2(20.0\,\text{m/s})}{9.8\,\text{m/s}^2}\sin 40^\circ = 2.62\ \text{s}\ .$$

Its $x$ coordinate on landing is

$$x = v_0 t \cos\theta_0 = (20.0\,\text{m/s})(2.62\,\text{s})\cos 40^\circ = 40.2\ \text{m}$$

(or Eq. 4-26 can be used). Assuming it stays where it lands, its coordinates at $t = 5.00\,\text{s}$ are $x = 40.2\,\text{m}$ and $y = 0$.