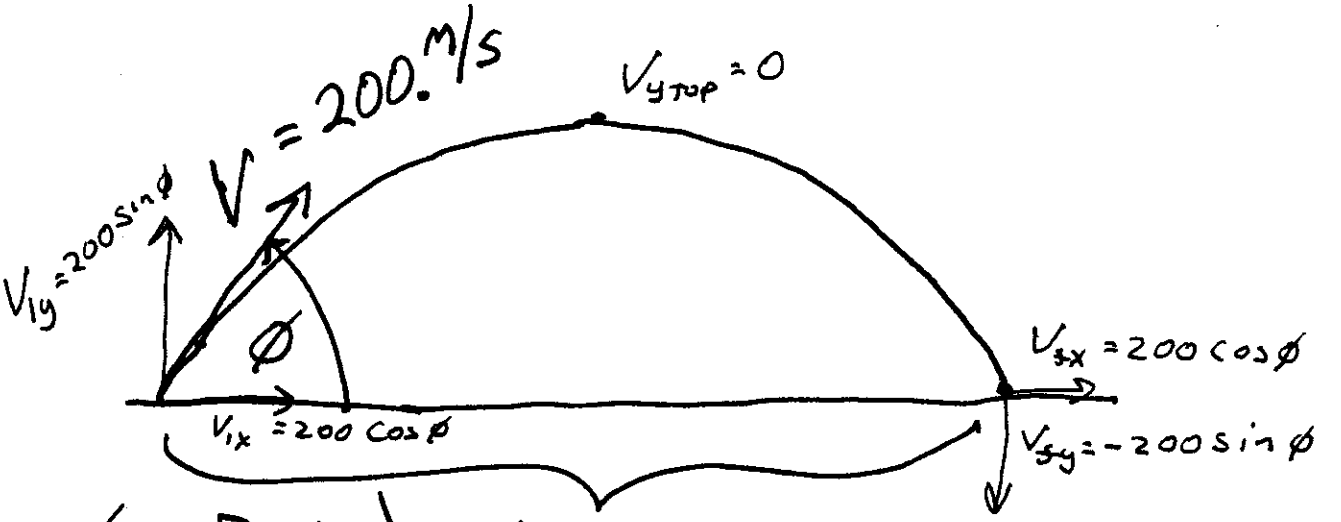
20080204_1200

Solution



(on Earth) $\Delta X = 500.0\,m$

$$\phi = \begin{matrix} 3.518203372\ deg \\ \text{or (its compliment)}\ deg \end{matrix}$$

In x Dir

$D = RT$ so $T = \frac{D}{R} = \frac{500m}{200\cos\phi}$

$$t_{total} = \frac{2.5}{\cos\phi}$$

In y Dir

$V_{fy} = V_{iy} + at$

$-200\sin\phi = 200\sin\phi + (-9.8)\left(\frac{2.5}{\cos\phi}\right)$

$-400\sin\phi = -\frac{24.5}{\cos\phi}$

$-400\sin\phi\cos\phi = 24.5$

$\sin\phi\cos\phi = \frac{24.5}{400} = \frac{49.0}{(400)(2)}$

$2\sin\phi\cos\phi = \frac{49}{400}$

Use this Trig Identity

$[2\sin\phi\cos\phi = \sin 2\phi]$

$\sin 2\phi = \frac{49}{400} = 0.1225$

$2\phi = \sin^{-1}(0.1225)$

$2\phi = 7.036406744^\circ$

$\phi = 3.518203372^\circ$

$\sin\phi = 0.061365652$

$V_{iy} = (200)(\sin\phi) = 12.27313053\ ^{m/s}$

use $V_f = V_i + at$ to get t_{top}

$T_{top} = \frac{V_f - V_i}{a} = \frac{12.27313053}{9.8}$

$t_{top} = 1.252360258\ sec$

$t_{total} = 2t_{top} = 2.504720516\ sec$

$\cos\phi = 0.998115352$

$V_{ix} = (200)(\cos\phi) = 199.6230705\ ^{m/s}$

Check with $D = RT$

$D = (199.6230705)(2.504720516)$

$D = 500.00000$

Must be correct