Appendix B Calculations and Mathamatica Code for Launch Direction, Initial Launch Speed, and Time Setting on Thursday October 16th

Derived Equation for velocity

$$v(t) = \{\frac{v_0}{\sqrt{2}} cos\theta + gt, \frac{v_0}{\sqrt{2}} sin\theta + gt, \frac{v_0}{\sqrt{2}} - gt\}$$

Substitute in -2, -3, and -9.8 for g in for the x, y, and z components of velocity respectively

$$v(t) = \{\frac{v_0}{\sqrt{2}} cos\theta - 2t, \frac{v_0}{\sqrt{2}} sin\theta - 3t, \frac{v_0}{\sqrt{2}} - 9.8t\}$$

Integrate velocity with respect to time in order to get position

$$d(t) = \int v(t)\, dt = \{t \frac{v_0}{\sqrt{2}} cos\theta - t^2, t \frac{v_0}{\sqrt{2}} sin\theta - \frac{3t^2}{2}, t \frac{v_0}{\sqrt{2}} - 4.9t^2\}$$

Add the position of Wiley's hiding point and set equal to the capture point

$$\left\{t \frac{v_0}{\sqrt{2}} cos\theta - t^2, t \frac{v_0}{\sqrt{2}} sin\theta - \frac{3t^2}{2}, t \frac{v_0}{\sqrt{2}} - 4.9t^2\right\} + \left(50, 30, \frac{783}{2}\right) = (150, 97, 320)$$

Solve Using "Solve" function in Mathamatica

v0 = 40.9168, t = 7.78012, θ = .776807