Appendix – Ballistic Equations of Motion

Given the model assumptions, the motion of the ball is a simple ballistics problem. The equations governing motion can be found in many textbooks and on many websites, and boil down to these 2 equations:

Where:

t is time since the ball was shot.

x(t) is the horizontal position of the ball at time t.

is the position of the ball at t=0

is the magnitude of the initial ball velocity

is the initial angle (relative to horizontal) that the ball is launched.

y(t) is the vertical position of the ball at time t.

is the release height of the ball

is the acceleration due to gravity (32.2 fps2, or 9.81 m/s2)

This gives us the X and Y motion of the center of the ball at any time t, given the initial launch position, launch velocity and launch angle. Now we need criteria for what constitutes a “made shot.”