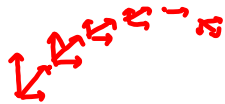


8.7 Modeling Motion using Parametric Equations

Projectiles - Objects that are launched, like a football

Trajectory - The path of a projectile

Range - Horizontal distance that a projectile travels



Recall

$$|\vec{v}_x| = |\vec{v}| \cos \theta \quad |\vec{v}_y| = |\vec{v}| \sin \theta$$

Ex A ball is kicked w/ an initial velocity of 18 fps @ 37° w/ the ground.

$$|\vec{v}_x| = 18 \cos 37^\circ \quad |\vec{v}_y| = 18 \sin 37^\circ$$

$$\approx 14 \text{ ft/s} \quad \approx 11 \text{ fps}$$

Parametric eqns

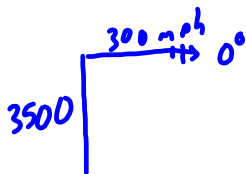
Horiz. dist. time · horiz. velocity

$$x = t |\vec{v}| \cos \theta$$

Vert. displacement time · displ. due to initial velocity displ. due to gravity

$$y = t |\vec{v}| \sin \theta - \frac{1}{2} g t^2$$

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$$\frac{300 \text{ mph}}{1 \text{ hr}} \times \frac{5280 \text{ ft}}{1 \text{ mi}} \times \frac{1 \text{ hr}}{3600 \text{ s}}$$

$$= 440 \text{ fps}$$

$$x = t 440 \cos 0^\circ$$

$$x = 440t$$

$$y = t(440) \sin 0^\circ - \frac{1}{2} 32 t^2 + 3500$$

$$y = -16t^2 + 3500$$