

Projectile Motion

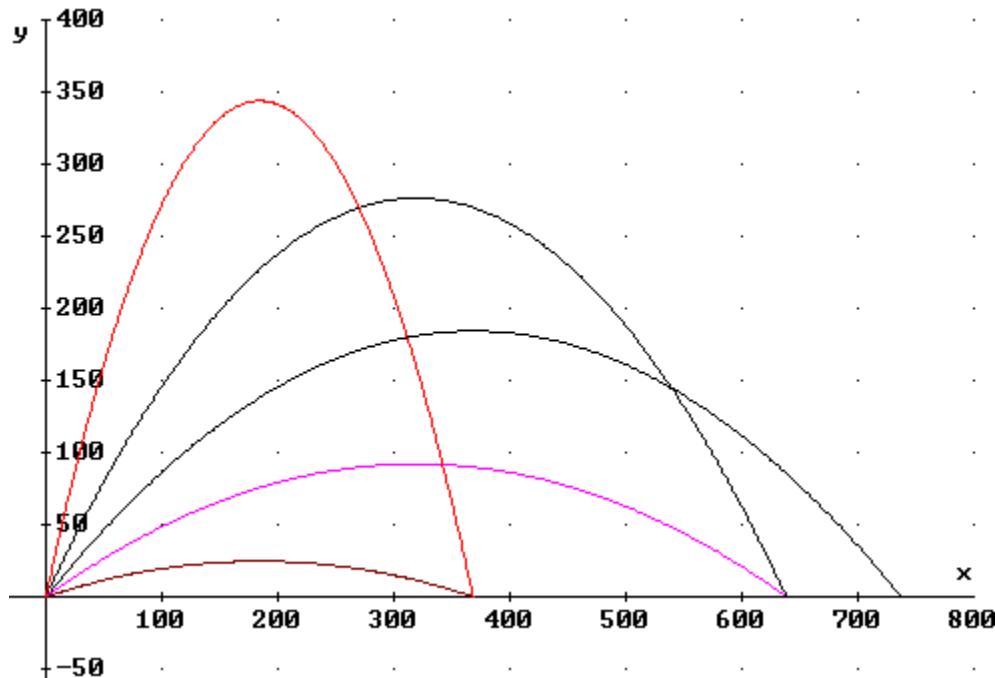
$$x = (v_0 \cos \alpha)t \quad y = (v_0 \sin \alpha)t - 0.5gt^2$$

Example: Aroldis Chapman of the Cincinnati Reds threw a baseball 105 mph (154 ft/s) on Friday September, 24, 2010. His team lost the game.

$$g = 32.174 \text{ ft/s}^2 = 9.81 \text{ m/s}^2$$

$$\text{time for ball to be in the air } t = \frac{2v_0 \sin \alpha}{g} \text{ with distance travelled } d = \frac{v_0^2 \sin 2\alpha}{2g}$$

$$\text{maximum height of } h = \frac{v_0^2 \sin^2 \alpha}{2g} \text{ when } t = \frac{v_0 \sin \alpha}{g}$$



angle (deg)	t (in air)	d (dist travelled)	max ht
15	2.478	368.6	24.7
30	4.786	638.4	92.1
45	6.769	737.1	184.3
60	8.290	638.4	276.4
75	9.247	368.6	343.9
90	9.573	0.0	368.6