

Section 1.7

(40) $x = (v_0 \cos \alpha)t$, $y = (v_0 \sin \alpha)t - \frac{1}{2}gt^2$

(a) eliminate t :

$$t = \frac{x}{v_0 \cos \alpha} \quad \text{and} \quad y = v_0 \sin \alpha \cdot \frac{x}{v_0 \cos \alpha} - \frac{1}{2}g \left(\frac{x^2}{v_0^2 \cos^2 \alpha} \right)$$

$$\Rightarrow y = (\tan \alpha) x - \frac{g}{2v_0^2 \cos^2 \alpha} x^2$$

(a parabola in (x, y))

(b) $\alpha = 30^\circ$; $v_0 = 1000$ m/s

$$y = \frac{1}{\sqrt{3}} x - \frac{9.8}{2 \cdot 1000^2 \cdot \frac{3}{4}} x^2$$

$$\Rightarrow y = \frac{1}{\sqrt{3}} x - \frac{19.6}{3000000} x^2$$

parabola, opens down
vertex \approx

$$(44,185, 12,755)$$

