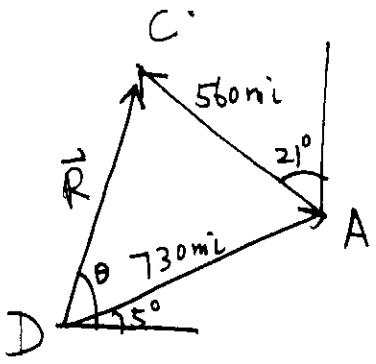
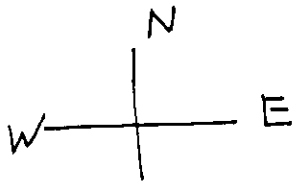
3.18





$$R_x = \Sigma A_x$$

$$= (730 \text{ mi} \cos 5^\circ) + (-560 \text{ mi} \sin 21^\circ)$$

points to right points to left

$$= 527 \text{ mi}$$

$$R_y = \Sigma A_y$$

$$= 730 \text{ mi} \sin 5^\circ + 560 \text{ mi} \cos 21^\circ \quad \text{both point up}$$

$$= 586 \text{ mi}$$

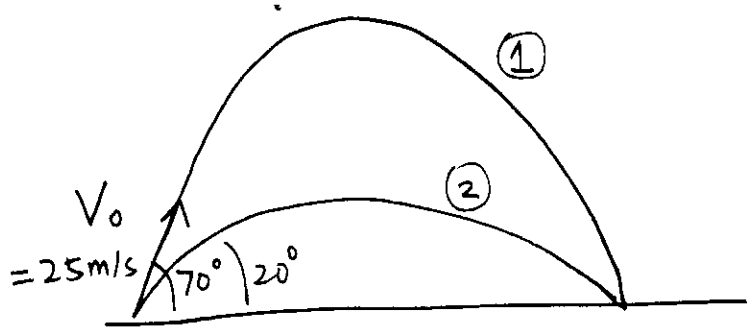
$$R = \sqrt{R_x^2 + R_y^2} = \sqrt{(527 \text{ mi})^2 + (586 \text{ mi})^2} = 788 \text{ miles}$$

$$\theta = \tan^{-1} \frac{R_y}{R_x} = \tan^{-1} \frac{586 \text{ mi}}{527 \text{ mi}} = \tan^{-1}(1.11)$$

$$= 48.1^\circ$$

Chicago is 788 miles 48.1° N of E from Dallas

3.71



For y motion ①

$$V_{oy1} = V_0 \sin 70^\circ$$

$$a_y = -9.80\ m/s^2$$

$$\Delta y_1 = y_f - y_i = 0 - 0 = 0$$

want t_1

use $\Delta x = V_0 t + \frac{1}{2} a t^2$

$$0 = V_{oy1} t_1 + \frac{1}{2} a_y t_1^2$$

$$0 = t_1 \left(V_{oy1} + \frac{1}{2} a_y t_1 \right)$$

$$t_1 = 0 \quad \text{or} \quad t_1 = \frac{-2 V_{oy1}}{a_y}$$

$$= \frac{-2 (25\ m/s) \sin 70^\circ}{-9.80\ m/s^2}$$

$$= 4.80\ s$$

For ②

$$V_{oy2} = V_0 \sin 20^\circ$$

$$a_y = -9.80\ m/s^2$$

$$\Delta y_2 = 0$$

want t_2

also use $\Delta x = V_0 t + \frac{1}{2} a t^2$

$$t_2 = -\frac{2 V_{oy2}}{a_y} = \frac{-2(25\ m/s)\sin 20^\circ}{-9.8\ m/s^2} = 1.74\ s$$

$$\Delta t = t_1 - t_2$$

$$= 4.8 - 1.74$$

$$= 3.06\ s$$