

Physics 10154 - Exam #2A

Answer the following two questions. Be sure to clearly indicate your answer with a circle or box. Show all work. If I cannot see how you arrived at an answer, I will deduct points!

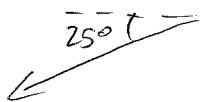
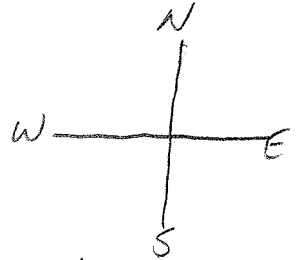
1. A driver travels along three straight roads to reach her destination.

The first road is 175 miles long, 25° South of West.

The second road is 130 miles long, 15° East of South.

The third road is 240 miles long, 29° South of East.

Find the magnitude and direction of the total displacement.



$$A_x = -175 \cos 25^\circ = -158.6$$

$$A_y = -175 \sin 25^\circ = -73.96$$



$$B_x = 130 \cos 75^\circ = 33.6$$

$$B_y = -130 \sin 75^\circ = -125.6$$

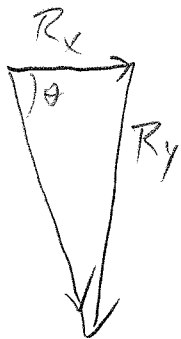


$$C_x = 240 \cos 29^\circ = 209.9$$

$$C_y = -240 \sin 29^\circ = -116.4$$

$$R_x = -158.6 + 33.6 + 209.9 = 84.9$$

$$R_y = -74.0 - 125.6 - 116.4 = -316$$



$$|\vec{R}| = \sqrt{84.9^2 + 316^2} = 330 \text{ miles}$$

$$\theta = \tan^{-1}\left(\frac{316}{84.9}\right) = 75^\circ \text{ S of E}$$

2. A ball is thrown straight up from ground level, reaching its maximum height in 2.5 seconds. A 2nd ball is launched from ground level at an angle of 35° above the horizontal, reaching the same maximum height. How far does the 2nd ball travel horizontally before returning to the ground?

Ball 1

$$\Delta y = ?$$

$$v_{0y} = ?$$

$$v_y = 0$$

$$a_y = -9.8$$

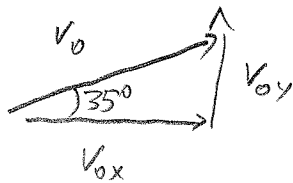
$$t = 2.5 \text{ s}$$

$$v_y = v_{0y} + a_y t$$

$$0 = v_{0y} - (9.8)(2.5)$$

$$v_{0y} = 24.5 \text{ m/s}$$

Ball 2



$$\tan 35^\circ = \frac{v_{0y}}{v_{0x}} \quad v_{0x} = \frac{24.5}{\tan 35^\circ} = 35 \text{ m/s}$$

$$\Delta x = ?$$

$$v_{0x} = 35 \text{ m/s}$$

$$v_x = 35 \text{ m/s}$$

$$a_x = 0$$

$$t = 5.0$$



$$\Delta x = (35)(5.0)$$

$$= \boxed{170 \text{ m}}$$

total time in air = $2t_{\text{max height}}$