

Homework 3

100 points

Instructions: Submit in canvas a copy of your solution by the due date. Assume no air resistance and acceleration of gravity $g = 10\text{m/s}^2$.

Multiple Choice (5 points each)

Choose one choice in the following multiple-choice questions:

1. The **magnitude** of a component of a vector must be:

- (a) less than or equal to the magnitude of the vector.
- (b) equal to the magnitude of the vector.
- (c) greater than or equal to the magnitude of the vector.
- (d) less than, equal to, or greater than the magnitude of the vector.
- (e) none of these.

2. One ball is dropped **vertically** from a window. At the same instant, a second ball is thrown **horizontally** from the same window. Which ball has the greater speed at ground level?

- (a) The dropped ball.
- (b) The thrown ball.
- (c) Neither—they both have the same speed on impact.
- (d) It depends on how hard the ball was thrown.
- (e) none of these.

3. Which statement is **incorrect** for projectile motion

- (a) The projectile has the same x velocity at any point on its path.
- (b) The acceleration of the projectile is positive and decreasing when the projectile is moving upwards,
zero at the top, and increasingly negative as the projectile descends.
- (c) The acceleration of the projectile is a constant negative value.

(d) The y component of the velocity of the projectile is zero at the highest point of the projectile's path.

(e) none of these.

4. A baseball is hit high and far. Which of the following statements is correct **at the highest point**,

(a) the magnitude of the acceleration is zero.

(b) the magnitude of the velocity is zero.

(c) the velocity is nonzero and points horizontally.

(d) the magnitude of the velocity is the maximum.

(e) none of these

Problems (20 points each)

Write down the formula and show all steps to receive full credit.

1. Using components find the resultant (magnitude and direction) of the following three vector displacements:

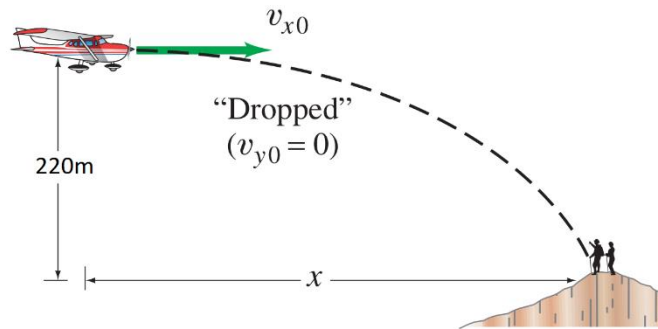
$$\vec{F}_1 = 24 \text{ m}, 36^\circ \text{ north of east};$$

$$\vec{F}_2 = 18 \text{ m}, 37^\circ \text{ east of north};$$

$$\vec{F}_3 = 26 \text{ m}, 33^\circ \text{ west of south}.$$

2. A diver running 2.5 m/s dives out horizontally from the edge of a vertical cliff and 3.5 s later reaches the water below. How high was the cliff and how far from its base did the diver hit the water?

3. A rescue plane wants to drop supplies to isolated mountain climbers on a rocky ridge 220m below. If the plane is traveling horizontally with a speed of $v_{x0} = 288\text{km/h}$ (or 80m/s), how far in advance of the recipients (horizontal distance x) must the goods be dropped



4. A passenger on a boat moving at 1.7 m/s on a still lake walks up a flight of stairs at a speed of 0.60 m/s (Fig. below). The stairs are angled at 45° pointing in the direction of motion as shown. What is the velocity (magnitude and direction) of the passenger relative to the water? Hint: write each velocity in components form and use the formula of addition of velocities.

