4.2.1. Which one of the following statements concerning the displacement of an object is false?

a) Displacement is a vector quantity that points from the initial position of an object to its final position.
b) The magnitude of an object's displacement is always equal to the distance it traveled from its initial position to its final position.
c) The magnitude of an object’s displacement is the shortest distance from its initial position to its final position.
d) The direction of an object’s displacement is indicated by an arrow that begins on the initial position of the object and ends on its final position.
e) The length of the arrow representing an object’s displacement is proportional to its magnitude.

4.3.1. In two-dimensional motion in the x-y plane, what is the relationship between the x part of the motion to the y part of the motion?

a) The x part of the motion is independent of the y part of the motion.
b) The y part of the motion goes as the square of the x part of the motion.
c) The x part of the motion is linearly dependent on the y part of the motion.
d) The x part of the motion goes as the square of the y part of the motion.
e) If the y part of the motion is in the vertical direction, then x part of the motion is dependent on the y part.

4.2.2. At time \( t_1 = 0 \) s, the position vector of a sailboat is \( \mathbf{r}_1 \). Later, at time \( t_2 \), the sailboat has a position vector \( \mathbf{r}_2 \). Which of the following expressions correctly indicates the displacement of the sailboat during the time interval \( t_2 - t_1 \)?

a) \( \mathbf{r}_2 \)
b) \( \mathbf{r}_1 \)
c) \( \mathbf{r}_2 + \mathbf{r}_1 \)
d) \( \mathbf{r}_2 - \mathbf{r}_1 \)
e) \( \mathbf{r}_1 - \mathbf{r}_2 \)

4.4.2. Which one of the following quantities is the change in object's velocity divided by the elapsed time as the elapsed time becomes very small?

a) average velocity
b) instantaneous velocity
c) average displacement
d) average acceleration
e) instantaneous acceleration

4.3.4. Complete the following statement: The direction of the instantaneous velocity of a particle is

a) tangent to the path of the particle.
b) the same as the direction of the average velocity vector.
c) perpendicular to the path of the particle.
d) the same as the direction of the acceleration of the particle.
e) perpendicular to the direction of the acceleration of the particle.