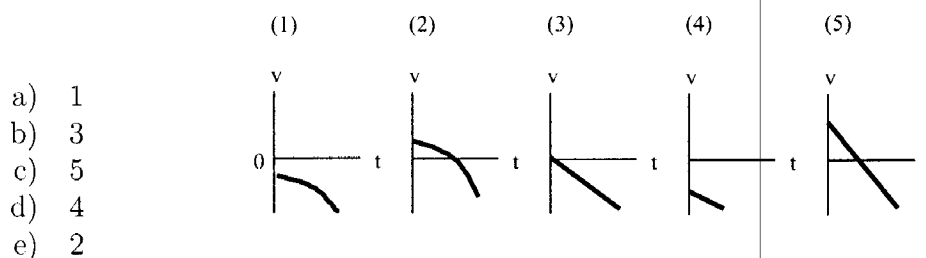


1. The components of vectors  $\vec{A}$  and  $\vec{B}$  are given as follows:  
 $A_x = +5.7$   $A_y = -3.6$   
 $B_x = -9.8$   $B_y = -6.5$   
The magnitude of the vector difference  $\vec{B} - \vec{A}$ , is closest to:
- a) 16
  - b) 5.0
  - c) 11
  - d) 250
  - e) -5.0
2. The following conversion equivalents are given: 1 kg = 1000 g, 1 liter = 1000 cm<sup>3</sup>, 1 liter = 0.0353 ft<sup>3</sup>. The density of a liquid is 0.30 g/cm<sup>3</sup>. The density of the liquid, in kg/ft<sup>3</sup>, is closest to:
- a) 10
  - b) 8.5
  - c) 9.3
  - d) 6.8
  - e) 7.6
3. A train starts from rest and accelerates uniformly, until it has traveled 5.4 km and acquired a velocity of 31 m/s. The train then moves at a constant velocity of 31 m/s for 400 s. The train then decelerates uniformly at 0.065 m/s<sup>2</sup>, until it is brought to a halt. The distance traveled by the train during deceleration, in km, is closest to:
- a) 6.0
  - b) 7.4
  - c) 6.7
  - d) 7.0
  - e) 6.3
4. A motorist makes a trip of 180 miles. For the first 90 miles she drives at a constant speed of 30 mph. At what constant speed must she drive the remaining distance if her average speed for the total trip is to be 40 mph?
- a) 52.5 mph
  - b) 45 mph
  - c) 55 mph
  - d) 60 mph
  - e) 50 mph

1. Which of the following situations is impossible?
- An object has constant nonzero acceleration and changing velocity.
  - An object has velocity directed east and acceleration directed west.
  - An object has constant nonzero velocity and changing acceleration.
  - An object has velocity directed east and acceleration directed east.
  - An object has zero velocity but nonzero acceleration.
2. A child standing on a bridge throws a rock straight down. The rock leaves the child's hand at  $t = 0$ . Which of the graphs shown here best represents the velocity of the stone as a function of time?



3. A toy cart starts on a straight track at position  $x = 2.37$  m, travels to  $x = 3.85$  m, then travels backward to  $x = 1.22$  m. The travel time from  $x = 2.37$  m to  $x = 1.22$  m is measured to be 17.94 s. The correct way to state the magnitude of its average velocity is:
- none of the others
  - $6.410 \times 10^{-2}$  m/s
  - $6 \times 10^{-2}$  m/s
  - $6.41 \times 10^{-2}$  m/s
  - $6.4 \times 10^{-2}$  m/s
4. A ball is projected upward at time  $t = 0.0$  s, from a point on a roof 60 m above the ground. The ball rises, then falls and strikes the ground. The initial velocity of the ball is 48.2 m/s. Consider all quantities as positive in the upward direction. At time  $t = 4.92$  s, the velocity of the ball is closest to:
- +12 m/s
  - +119 m/s
  - 12 m/s
  - zero
  - 119 m/s

1. The position of a particle moving along the  $x$  axis is given by  $x = (35 + 16t - 5.0t^2)$  m, where  $t$  is time in s. What is the closest time at which the velocity becomes  $1/2$  of the initial velocity at  $t = 0$ ?
  - a) 5.0 s
  - b) 2.0 s
  - c) 1.0 s
  - d) 0.80 s
  - e) 35 s
  
2. The following conversion equivalents are given:  $1 \text{ kg} = 1000 \text{ g}$ ,  $1 \text{ liter} = 1000 \text{ cm}^3$ ,  $1 \text{ liter} = 0.0353 \text{ ft}^3$ . The density of a liquid is  $0.30 \text{ g/cm}^3$ . The density of the liquid, in  $\text{kg/ft}^3$ , is closest to:
  - a) 8.5
  - b) 6.8
  - c) 9.3
  - d) 7.6
  - e) 10
  
3. A toy cart starts on a straight track at position  $x = 2.37$  m, travels to  $x = 3.85$  m, then travels backward to  $x = 1.22$  m. The travel time from  $x = 2.37$  m to  $x = 1.22$  m is measured to be 17.94 s. The correct way to state the magnitude of its average velocity is:
  - a)  $6 \times 10^{-2} \text{ m/s}$
  - b)  $6.41 \times 10^{-2} \text{ m/s}$
  - c) none of the others
  - d)  $6.410 \times 10^{-2} \text{ m/s}$
  - e)  $6.4 \times 10^{-2} \text{ m/s}$
  
4. A cylindrical glass jar of radius 5 cm and height 10 cm is filled with approximately identical marbles. The radius of the marble is about 0.2 cm. The number of marbles in the jar is approximately: Note:
  - a)  $10^4$
  - b)  $10^2$
  - c)  $10^8$
  - d)  $10^0$
  - e)  $10^6$

1. A toy rocket, initially at rest, is launched vertically from ground level ( $y = 0$  m), at time  $t = 0.0$  s. The rocket engine provides constant upward acceleration during the burn phase. At the instant of engine burnout, the rocket has risen to 82 m and acquired a velocity of 90 m/s. The rocket continues to rise in unpowered flight, reaches maximum height, and falls back to the ground. Neglecting air resistance, the time interval, during which the rocket engine provides upward acceleration, is closest to:
  - a) 1.5 s
  - b) 2.0 s
  - c) 1.3 s
  - d) 1.8 s
  - e) 1.6 s
  
2. The following conversion equivalents are given:  $1 \text{ kg} = 1000 \text{ g}$ ,  $1 \text{ liter} = 1000 \text{ cm}^3$ ,  $1 \text{ liter} = 0.0353 \text{ ft}^3$ . The density of a liquid is  $0.30 \text{ g/cm}^3$ . The density of the liquid, in  $\text{kg/ft}^3$ , is closest to:
  - a) 8.5
  - b) 7.6
  - c) 10
  - d) 6.8
  - e) 9.3
  
3. A motorist makes a trip of 180 miles. For the first 90 miles she drives at a constant speed of 30 mph. At what constant speed must she drive the remaining distance if her average speed for the total trip is to be 40 mph?
  - a) 60 mph
  - b) 55 mph
  - c) 50 mph
  - d) 52.5 mph
  - e) 45 mph
  
4. On the earth, when an astronaut throws a 0.250-kg stone vertically upward, it returns to his hand 8.00 s later. On planet X he finds that, under the same circumstances, the stone returns to his hand in 16.0 s. In both cases, he throws the stone with the same initial velocity and it feels negligible air resistance. The acceleration due to gravity on planet X (in terms of  $g$ ) is closest to:
  - a)  $\frac{g}{4}$
  - b)  $2g$
  - c)  $\frac{g}{2}$
  - d)  $g\sqrt{2}$
  - e)  $\frac{g}{\sqrt{2}}$