1. Let $\vec{A}$ = (2 m) î + (6 m) ĵ and $\vec{B}$ = (4 m)î+ (2 m)ĵ. Compute the angle between vectors $\vec{A}$ and $\vec{B}$ (Hint: use the dot product).

A) 45°
B) 30°
C) 85°
D) 10°
E) 68°

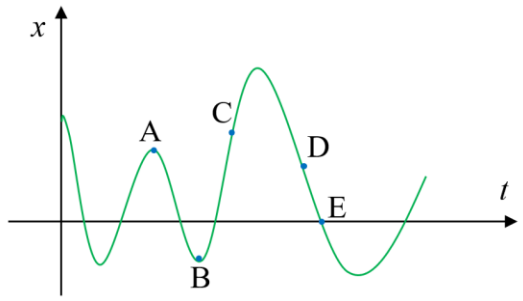
2. A marathon is 26.2188 miles long. An expert marathon runner finishes the race in 2 hours. What was her average speed in SI units?

A) 3.17 m/s
B) 10.1 m/s
C) 4.92 m/s
D) 5.86 m/s
E) 7.44 m/s

3. A car accelerates along a straight line after a stop at a traffic light, its distance from the light is given by $x = 3*t^2$ m. Calculate the instantaneous velocity of the car at t = 0.5 s and t = 3.0 s.

A) v_x = 2.0 m/s at t = 0.5 s; v_x = 27.0 m/s at t = 3 s;
B) v_x = 0.75 m/s at t = 0.5 s; v_x = 27.0 m/s at t = 3 s;
C) v_x = 0.75 m/s at t = 0.5 s; v_x = 18.0 m/s at t = 3 s;
D) v_x = 3.0 m/s at t = 0.5 s; v_x = 27.0 m/s at t = 3 s;
E) v_x = 3.0 m/s at t = 0.5 s; v_x = 18.0 m/s at t = 3 s;

4. In the following *x*-*t* graph, at which times the instantaneous velocity is zero?



A) A,B and E
B) A and B
C) No such times among indicated
D) C and D
E) E

5. Find the magnitude of 3A-2B, if **A** = -3**i** + **j**, **B** = **i** + 2**j.** Select the closest answer.

A) 1.4
B) 22.6
C) 11.0
D) 0.44
E) 5.7

6. Find the dot product **A**·**B ,** if **A** = -3**i** + **j** , **B** = **i** + 2**j**

A) -1
B) 1
C) 0
D) 2
E) -2

7. Find the angle between vector **B** = **i** + 2**j** and the positive x-direction.

A) 85.7°
B) 117°
C) 45.5°
D) 63.4°
E) 23.3°

8.The position of an object as a function of time is given by $x(t) = at^3 - bt^2 + ct - d$, where a = 3.0 m/s^3, b = 4.0 m/s^2, c = 6.0 m/s and d = 7.0 m. Calculate the average velocity (in m/s) in the time interval between 1 and 2 s.

A) 3
B) -1
C) 10
D) 15
E) 20

9. A stone is thrown from the top of a building with an initial velocity of 20 m/s downward. The top of the building is 60 m above the ground. How much time elapses between the instant of release and the instant of impact with the ground?

A) 2.0 s
B) 6.1 s
C) 3.5 s
D) 1.6 s
E) 1.0 s

10. A girl drops a ball from the edge of a cliff. The ball takes 4.2 s to reach the bottom of the cliff. How high (in m) is the cliff?

A) 86
B) 153
C) 121
D) 177
E) 235

11. A car's velocity as a function of time is given by $v_x(t) = a + bt^2$, where a = 3.00 m/s and b = 0.100 m/s^3. Calculate the average acceleration for the time interval t = 0 to t = 5.00 s and the instantaneous acceleration for t=5.00 s?

A) Average 1.0 m/s^2, instantaneous 1.0 m/s^2
B) Average 0.50 m/s^2, instantaneous 0.25 m/s^2
C) Average 0.50 m/s^2, instantaneous 1.0 m/s^2
D) Average 1.50 m/s^2, instantaneous 0.25 m/s^2
E) Average 0.0 m/s^2, instantaneous 1.0 m/s^2

12. Cars A and B are racing each other along the same straight road. Car A has a head start and is a distance 314 m beyond the starting line at t=0. Car A travels at a constant speed 37.0 m/s. Car B starts at the starting line but travels at a constant speed 67.2 m/s. How far from the starting line will it catch up with car A?

A) 540 m
B) 700 m
C) 920 m
D) 360 m
E) 1030 m

13. One cubic inch (in^3) of a certain alloy has a mass of 134.0 gram. Find its density in kg/m^3.

A) 1000
B) 13 600
C) 1
D) 5700
E) 8177

14. For general projectile motion, when the projectile is at the highest point of its trajectory?

A) its acceleration is zero.
B) its velocity is perpendicular to the acceleration.
C) its velocity and acceleration are both zero.
D) the horizontal component of its velocity is zero.
E) the horizontal and vertical components of its velocity are zero.

15. An airplane is flying at a speed of 2.00×10^2 m/s in level flight at an altitude of 8.00×10^2 m. A package is to be dropped from the airplane to land on a target on the ground. Ignore air resistance. At what horizontal distance (in kilo-meters) away from the target should the package be released so that it lands on the target?

A) 0.67
B) 2.56
C) 1.12
D) 3.44
E) 4.01

16. A child throws a ball with an initial speed of 8.00 m/s at an angle of 40.0° above the horizontal. The ball leaves her hand 1.00 m above the ground and experience negligible air resistance. What is the magnitude of the ball's velocity just before it hits the ground?

A) 9.14 m/s
B) 3.88 m/s
C) 10.91 m/s
D) 19.6 m/s
E) 13.6 m/s

ANSWER KEY

1. A 45°
2. D 5.86 m/s
3. E v_x = 3.0 m/s at t = 0.5 s; v_x = 18.0 m/s at t = 3 s;
4. B A and B
5. C 11.0
6. A -1
7. D 63.4deg.
8. D 15
9. A 2s
10. A 86
11. C Average 0.50 m/s^2, instantaneous 1.0 m/s^2
12. B 700m
13. E 8177
14. B its velocity is perpendicular to the acceleration.
15. B 2.56km
16. A 9.14m/s