PHY2048 Exam 1 (Practice)

Fall 2019

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Abstract

This exam consists of xx multiple choice questions. **You must record your answers on a Scantron sheet.** Don't record your answers on this print-out; I will not accept it as a submission. Fill out the Scantron sheet in with a pencil, not a pen. **Don't forget to include your name, the course, and exam number on the Scantron sheet.**

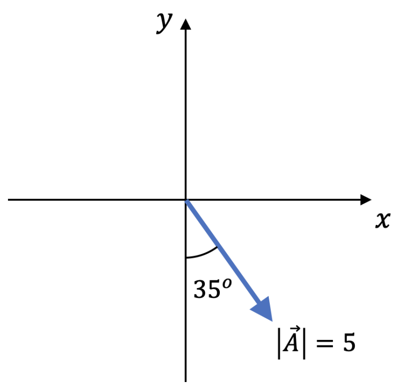


Figure 1: Figure for Problem 1

1. What is the y-component of the vector $\vec{A}$, shown in Figure 1 above?

   (a) -2.87
   (b) 2.87
   (c) -4.10
   (d) 4.10

2. Consider the vector $\vec{A} = -2\hat{\imath} + 4\hat{\jmath}$. What is the direction of $\vec{A}$? Measure the angle **counter-clockwise from the $+x$-axis**.

   (a) 27^o
   (b) 63^o
   (c) 117^o
   (d) 243^o

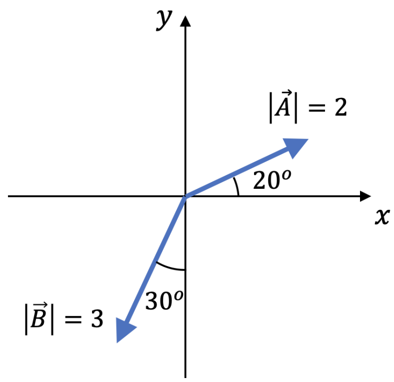


Figure 2: Figure for Problems 3 and 4

3. Consider the vectors $\vec{A}$ and $\vec{B}$, as shown in Figure 2 above. What is the x-component of $\vec{A} + \vec{B}$?
   (a) 0.4
   (b) 1.5
   (c) 1.9
   (d) 3.4
4. Consider the vectors $\vec{A}$ and $\vec{B}$, as shown in Figure 2 above. What is $\vec{A} \cdot \vec{B}$?
   (a) 3.9
   (b) -3.9
   (c) 4.6
   (d) -4.6
5. Consider the vectors $\vec{A} = -\hat{\imath} + 3\hat{\jmath}$ and $\vec{B} = 2\hat{\imath} + \hat{k}$. What is the cross product, $\vec{A} \times \vec{B}$?
   (a) $3\hat{\imath} + \hat{\jmath} - 6\hat{k}$
   (b) $-3\hat{\imath} + \hat{\jmath} + 6\hat{k}$
   (c) $3\hat{\imath} - \hat{\jmath} + 6\hat{k}$
   (d) $-3\hat{\imath} - \hat{\jmath} + 6\hat{k}$
6. Under what conditions can kinematics be used?
   (a) Kinematics can always be used
   (b) Only if the acceleration of an object is constant
   (c) Only if the speed of an object is constant
   (d) Only if the motion of an object is in a straight line
7. A jogger runs half of a circular track in 100s. If the radius of the track is 100m, what is the jogger's average **velocity**?
   (a) 2 m/s
   (b) 3.14 m/s
   (c) 4 m/s
   (d) 6.28 m/s

8. A car accelerates at 4.7 m/s^2, from rest, to a top speed of 57 m/s. How long does it take the car to reach its top speed?
    (a) 4.7s
    (b) 12.1s
    (c) 57s
    (d) 267.9s
9. An Olympic sprinter can run the 100m dash in about 10s. If the sprinter's acceleration were constant during the sprint, what would it be?
    (a) 2 m/s^2
    (b) 5 m/s^2
    (c) 10 m/s^2
    (d) 20 m/s^2
10. The observatory on the 82nd floor of the Empire State Building is 320m above the ground. If you dropped a penny from there, with what speed would it hit the ground?
    (a) 8 m/s
    (b) 10 m/s
    (c) 80 m/s
    (d) 6,400 m/s
11. How fast would you have to throw an object upward for it to reach a height of 12.5m?
    (a) 0 m/s
    (b) 10 m/s
    (c) 15.8 m/s
    (d) 250 m/s
12. A car accelerates from rest at 6 m/s^2 for 5s. What is the car's average velocity during this time?
    (a) 0 m/s
    (b) 15 m/s
    (c) 30 m/s
    (d) 45 m/s
13. A car accelerates from rest at 5 m/s^2 for 200m. Suddenly, the car brakes at 7 m/s^2 until stopped. How long does the entire trip take?
    (a) 6.4s
    (b) 8.9s
    (c) 10.2s
    (d) 15.3s

14. A bicycle's velocity points in the $-x$-direction while its acceleration points in the $+x$-direction. Which of the following statements about the bicycle is true?

    (a) The bicycle is slowing down
    (b) The bicycle is speeding up
    (c) The bicycle's speed isn't changing
    (d) There isn't enough information given to know the behavior of the bicycle's speed

15. An object moves with the following equation of motion:

$$x(t) = \alpha t + \beta t^3 - \gamma t^5$$

    with the constants $\alpha = 1$ m/s, $\beta = 2.5$ m/s^3, and $\gamma = 1.5$ m/s^5. What is the object's acceleration at $t = 0.5$s?

    (a) -1.75 m/s^2
    (b) 2.41 m/s^2
    (c) 3.75 m/s^2
    (d) 4.75 m/s^2

16. A projectile is launched with a speed of 15 m/s at an angle of 30^o. At its peak, what is its speed?

    (a) 0 m/s
    (b) 7.5 m/s
    (c) 13 m/s
    (d) 15 m/s

17. A projectile is launched with a speed of 15 m/s at an angle of 30^o. After 1s, what is the projectile's acceleration?

    (a) 2.5 m/s^2
    (b) 10 m/s^2
    (c) 13 m/s^2
    (d) 15 m/s^2

18. A projectile is fired off the roof of a 15m tall building, with a speed of 17 m/s and angle of 40^o above the horizontal. What is the maximum height, above the ground, of the projectile?

    (a) 3m
    (b) 12m
    (c) 15m
    (d) 18m

19. A projectile is fired off the roof of a 15m tall building, with a speed of 17 m/s and angle of 40^o above the horizontal. How far away from the building does the projectile land?

    (a) 14.3m
    (b) 24.7m
    (c) 28.6m
    (d) 39m

20. Which of the following statements is true regarding the trajectory of a projectile?

    (a) The trajectory is always symmetric
    (b) The trajectory is symmetric only if the projectile starts and ends at the same height
    (c) The trajectory is symmetric only if the projectile starts and ends at the same location
    (d) The trajectory is never symmetric

21. During uniform circular motion, which of the following quantities is constant?

    (a) Position
    (b) Speed
    (c) Velocity
    (d) Acceleration

22. The International Space Stations (ISS) moves with a roughly uniform, circular motion, with a period of 92.7 minutes and a speed of 7.66 km/s. What is the radius of the ISS' orbit?

    (a) 113km
    (b) 710km
    (c) 6,781km
    (d) 42,604km

23. The International Space Stations (ISS) moves with a roughly uniform, circular motion, with a period of 92.7 minutes and a speed of 7.66 km/s. What is the angular velocity of the ISS?

    (a) 0.00082 rad/s
    (b) 0.00113 rad/s
    (c) 0.0678 rad/s
    (d) 0.82 rad/s

24. The International Space Stations (ISS) moves with a roughly uniform, circular motion, with a period of 92.7 minutes and a speed of 7.66 km/s. What is the angular acceleration of the ISS?

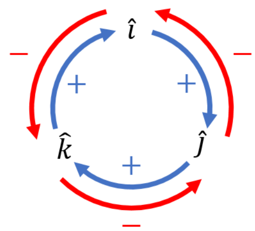
    (a) 0 rad/s^2
    (b) 0.00865 rad/s^2
    (c) 8.65 rad/s^2
    (d) 865 rad/s^2

FORMULA SHEET

- Vectors:

$$\begin{aligned}\vec{A}\cdot\vec{B} &= AB\cos\theta \\ &= A_xB_x + A_yB_y + A_zB_z\end{aligned}$$

$$\left|\vec{A}\times\vec{B}\right| = AB\sin\theta$$



- Kinematics:

$$g = 10\ \mathrm{m/s^2}$$

$$\vec{v}_{av} = \frac{\Delta\vec{x}}{\Delta t}; \quad \vec{v}(t) = \frac{d\vec{x}}{dt}$$

$$\vec{a}_{av} = \frac{\Delta\vec{v}}{\Delta t}; \quad \vec{a}(t) = \frac{d\vec{v}}{dt}$$

$$\Delta x = v_0 t + \frac{1}{2}at^2$$

$$v = v_0 + at$$

$$v^2 = v_0^2 + 2a\Delta x$$

- Circular motion:

$$a_c = \frac{v^2}{r} = \omega^2 r$$

$$v = \omega r$$

$$\omega = \frac{2\pi}{T}$$

ANSWERS

1. (c)
2. (c)
3. (a)
4. (d)
5. (a)
6. (b)
7. (a)
8. (b)
9. (a)
10. (c)
11. (c)
12. (b)
13. (d)
14. (a)
15. (c)
16. (c)
17. (b)
18. (d)
19. (d)
20. (b)
21. (b)
22. (c)
23. (b)
24. (a)