TAM 212. Midterm 1 Practice. Feb 11, 2013. (V3)

- There are 50 questions worth points as shown in each question.
- You must not communicate with other students during this test.
- No electronic devices allowed.
- This is a 2 hour exam.
- Do not turn this page until instructed to do so.
- There are several different versions of this exam.

1. Fill in your information:

Full Name: ______________________________

UIN (Student Number): ______________________________

NetID: ______________________________

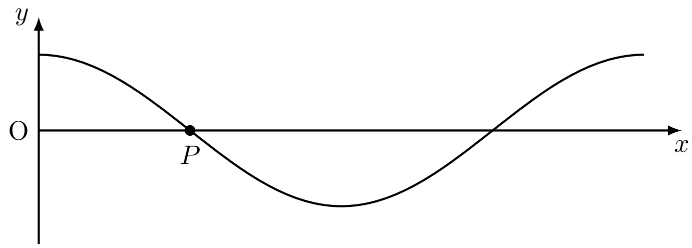
2. Circle your discussion section:

	Monday	**Tuesday**	**Wednesday**	**Thursday**
8–9		ADI (260) Karthik		
9–10		ADC (260) Venanzio		ADK (260) Aaron
10–11		ADD (256) Aaron ADQ (344) Jan	ADS (252) Ray	ADT (243) Aaron ADU (344) Jan
11–12		ADE (252) Jan		ADL (256) Kumar
12–1	ADA (243) Ray ADP (135) Seung	ADF (335) Seung ADG (336) Kumar	ADJ (256) Ray ADR (252) Lin	ADN (260) Kumar
1–2				
2–3				
3–4				
4–5	ADV (252) Karthik		ADO (260) Mazhar ADW (252) Lin	
5–6	ADB (260) Mazhar	ADH (260) Karthik	ADM (243) Mazhar	

3. Fill in the following answers on the Scantron form:

91. E
92. E
93. D
94. A
95. E
96. D

1. (1 point) A particle is moving to the right along a variable-height ground with ground height given by $y(x) = \cos(x/10)$ m. The particle's horizontal velocity component is a constant $v_x = 20$ m/s. What is the vertical component of velocity v_y when $x = 5\pi$ m?



(A) $v_y = 0$ m/s

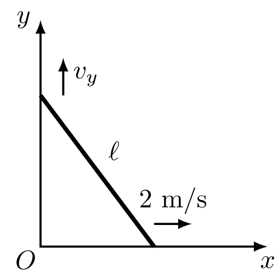
(B) $v_y < -3$ m/s

(C) $3 \text{ m/s} \leq v_y$

(D) $0 \text{ m/s} \leq v_y < 3$ m/s

(E) $-3 \text{ m/s} \leq v_y < 0$ m/s

2. (1 point) A ladder leaning against the wall has a fixed length of $\ell = 5$ m. The bottom of the ladder is 3 m from the wall and is moving along the ground away from the wall at a speed of 2 m/s. What is the vertical component of the velocity v_y of the top of the ladder, assuming it remains in contact with the wall?



(A) $0 \text{ m/s} < v_y < 1 \text{ m/s}$

(B) $1 \text{ m/s} < v_y$

(C) $v_y < -1 \text{ m/s}$

(D) $-1 \text{ m/s} \leq v_y < 0 \text{ m/s}$

(E) $v_y = 0 \text{ m/s}$

3. (1 point) Given a polar basis $\hat{e}_r, \hat{e}_\theta$, the time derivative of the angular basis vector satisfies

$$\dot{\hat{e}}_\theta = -\hat{e}_r.$$

(A) True

(B) False

4. (1 point) The particle P has polar coordinates $r = 3$ m, $\theta = 60°$ and velocity $\vec{v} = -\hat{\imath}$. Which statement is true?

(A) $\dot{r} \geq 0$ and $\dot{\theta} \geq 0$

(B) $\dot{r} < 0$ and $\dot{\theta} \geq 0$

(C) $\dot{r} < 0$ and $\dot{\theta} < 0$

(D) $\dot{r} \geq 0$ and $\dot{\theta} < 0$

5. (1 point) A point currently has position vector $\vec{r} = -2\hat{\imath} + 4\hat{\jmath}$ m and is rotating about the origin in the x–y plane with angular velocity $\omega = -3$ rad/s. What is the $\hat{\jmath}$ component of the velocity v_y of the point?

(A) -5 m/s $\leq v_y < 0$ m/s

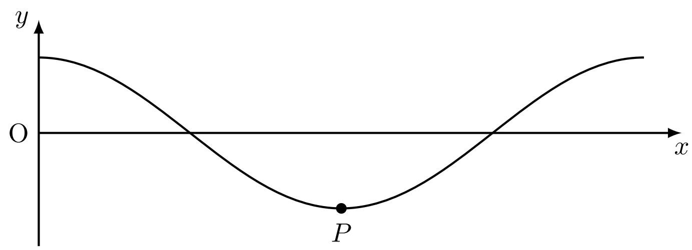
(B) 0 m/s $< v_y < 5$ m/s

(C) 5 m/s $\leq v_y$

(D) $v_y = 0$ m/s

(E) $v_y < -5$ m/s

6. (1 point) A particle is moving to the right along a variable-height ground at a constant speed of $v = 20$ m/s. The ground height is given by $y(x) = \cos(x/10)$ m. When the particle is at the lowest point on the ground, what is the vertical acceleration a_y?



(A) $3 \text{ m/s}^2 \leq a_y$

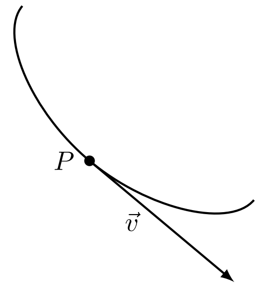
(B) $0 \text{ m/s}^2 < a_y < 3 \text{ m/s}^2$

(C) $a_y < -3 \text{ m/s}^2$

(D) $-2 \text{ m/s}^2 \leq a_y < 0 \text{ m/s}^2$

(E) $a_y = 0 \text{ m/s}^2$

7. (1 point) A point P is moving around a curve and at a given instant has position and velocity $\vec{v}$ as shown.



Which direction is the closest to the direction of the normal basis vector $\hat{e}_n$ at the instant shown?

(A) $\nearrow$

(B) $\searrow$

(C) $\nwarrow$

(D) $\swarrow$

8. (1 point) A car driving down the road is at a distance $s = t^2$ m from its starting point. At $t = 2$ s the car is driving around a curve with radius of curvature $\rho = 8$ m. What is the magnitude of the acceleration a at this time?

(A) $a < 0 \text{ m/s}^2$

(B) $1 \text{ m/s}^2 \leq a < 2 \text{ m/s}^2$

(C) $a = 0 \text{ m/s}^2$

(D) $0 \text{ m/s}^2 \leq a < 1 \text{ m/s}^2$

(E) $2 \text{ m/s}^2 \leq a$

9. (1 point) If a particle has position vector $\vec{r}(t) = 5e^t\,\hat{\imath} + \sin(2t)\,\hat{\jmath} + (1 - 3t)\,\hat{k}$ m, what is its speed $v(0)$ at time $t = 0$ s?

(A) $15\text{ m/s} \le v(0)$

(B) $v(0) = 0\text{ m/s}$

(C) $10\text{ m/s} \le v(0) < 15\text{ m/s}$

(D) $5\text{ m/s} \le v(0) < 10\text{ m/s}$

(E) $0\text{ m/s} < v(0) < 5\text{ m/s}$

10. (1 point) Given a polar basis $\hat{e}_r, \hat{e}_\theta$, the time derivative of the radial basis vector satisfies

$$\dot{\hat{e}}_r \cdot \hat{e}_r = 0.$$

(A) False

(B) True

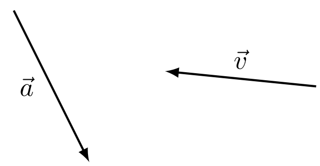
11. (1 point) A car is observed moving in the plane with velocity $\vec{v} = 2\hat{\imath} - 4\hat{\jmath}$ and acceleration $\vec{a} = 2\hat{\imath} + \hat{\jmath}$. At this instant, is it:

(A) slowing down

(B) keeping its speed constant

(C) speeding up

12. (1 point) The velocity $\vec{v}$ and acceleration $\vec{a}$ for a single particle P are shown below at a particular instant.



Which statement is true at this instant?

(A) the particle's speed is not changing

(B) the particle slowing down

(C) the particle is speeding up

13. (1 point) At a certain instant, particles P and Q have position vectors and velocities given by:

$$\vec{r}_P = 3\hat{\imath} + 4\hat{\jmath} \text{ m} \qquad \vec{r}_Q = -2\hat{\imath} + 6\hat{\jmath} \text{ m}$$
$$\vec{v}_P = -\hat{\imath} - 2\hat{\jmath} \text{ m/s} \qquad \vec{v}_Q = 2\hat{\imath} + 5\hat{\jmath} \text{ m/s}$$

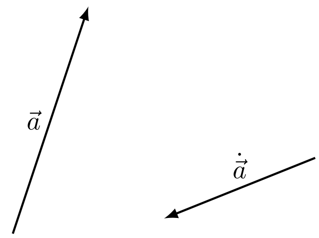
Which statement is true at this instant?

(A) the two particles are moving further apart

(B) the two particles are moving closer together

(C) the two particles are staying at the same distance from each other

14. (1 point) The vector $\vec{a}$ and its derivative $\dot{\vec{a}}$ are shown below.



Which statement is true?

(A) the length of $\vec{a}$ is increasing

(B) the length of $\vec{a}$ is decreasing

(C) the length of $\vec{a}$ is staying the same

15. (1 point) A particle is moving in the plane with changing radius so that at a particular instant we have $r = 1$ m and $\dot{r} = -4$ m/s. The speed is $v = 5$ m/s. What is the magnitude of $\dot{\theta}$?

(A) $6 \text{ rad/s} \le |\dot{\theta}| < 8 \text{ rad/s}$

(B) $8 \text{ rad/s} \le |\dot{\theta}|$

(C) $2 \text{ rad/s} \le |\dot{\theta}| < 4 \text{ rad/s}$

(D) $4 \text{ rad/s} \le |\dot{\theta}| < 6 \text{ rad/s}$

(E) $0 \text{ rad/s} \le |\dot{\theta}| < 2 \text{ rad/s}$

16. (1 point) A particle starts at the origin at time $t = 0$ s and its velocity is given by $\vec{v} = t^3\,\hat{\imath} - t\,\hat{\jmath}$ m. At time $t = 2$ s, what is the particle's distance r from the origin?

(A) $12 \text{ m} \leq r < 16 \text{ m}$

(B) $0 \text{ m} \leq r < 4 \text{ m}$

(C) $4 \text{ m} \leq r < 8 \text{ m}$

(D) $16 \text{ m} \leq r$

(E) $8 \text{ m} \leq r < 12 \text{ m}$

17. (1 point) A particle moves so that its position vector in the Cartesian basis is given by

$$\vec{r} = \cos t\,\hat{\imath} + \sin t\,\hat{\jmath} + t\,\hat{k} \text{ m}.$$

Using cylindrical coordinates, what is the angular component of velocity v_θ at $t = \pi/4$ s?

(A) $0 \text{ m/s} \leq v_\theta < 1 \text{ m/s}$

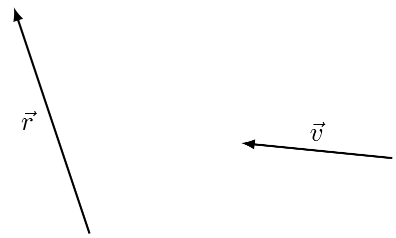
(B) $-1 \text{ m/s} \leq v_\theta < 0 \text{ m/s}$

(C) $v_\theta = 0 \text{ m/s}$

(D) $v_\theta < -1 \text{ m/s}$

(E) $1 \text{ m/s} \leq v_\theta$

18. (1 point) The position vector $\vec{r}$ and velocity $\vec{v}$ for a single particle P are shown below at a particular instant.



Which statement is true at this instant?

(A) the distance of P from the origin is staying the same

(B) the distance of P from the origin is decreasing

(C) the distance of P from the origin is increasing

19. (1 point) A point is rotating about the origin in the x–y plane with angular velocity $\omega = 2$ rad/s and velocity $\vec{v} = 4\hat{\imath} - 2\hat{\jmath}$ m/s. What is the x coordinate of the point?

(A) $2 \text{ m} \leq x$

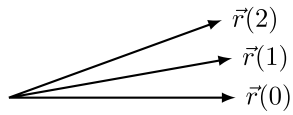
(B) $-2 \text{ m} \leq x < 0 \text{ m}$

(C) $x < -2 \text{ m}$

(D) $0 \text{ m} < x < 2 \text{ m}$

(E) $x = 0 \text{ m}$

20. (1 point) The position vector $\vec{r}(t)$ of a point is shown below at $t = 0$ s, $t = 1$ s, and $t = 2$ s.



Which direction is the closest to the direction of the acceleration $\vec{a}(0)$ at time $t = 0$ s?

(A) $\leftarrow$

(B) $\rightarrow$

(C) $\uparrow$

(D) $\downarrow$

21. (1 point) If $\vec{a} = 3\hat{\imath} + 4\hat{\jmath}$ and the derivative is $\dot{\vec{a}} = 2\hat{\imath} - \hat{\jmath}$, what can we say about the rate of change of the length of $\vec{a}$ at this instant?

(A) the length of $\vec{a}$ is increasing

(B) the length of $\vec{a}$ is staying the same

(C) the length of $\vec{a}$ is decreasing

22. (1 point) A point is moving with position vector

$$\vec{r} = (t^2 - 2t)\,\hat{\imath} + t^2\,\hat{\jmath}.$$

What is the radius of curvature ρ at $t = 1$ s?

(A) ρ is infinite

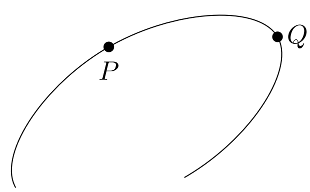
(B) $\rho = 0$ m

(C) $0 \text{ m} < \rho < \frac{1}{2}$ m

(D) $\frac{1}{2} \text{ m} \leq \rho < 1$ m

(E) $1 \text{ m} \leq \rho < \infty$

23. (1 point) A car is driving on a curved race track at constant speed, with the top view shown below.



How does the magnitude of the car's acceleration a_P at point P compare to the value a_Q at point Q?

(A) $a_P > a_Q$

(B) $a_P = a_Q$

(C) $a_P < a_Q$

24. (1 point) A particle is moving with position vector given by $\vec{r} = t\,\hat{\imath} + t^2\,\hat{\jmath}$ m. At time $t = 1$ s, what is the vertical component of the normal vector $e_{n,y}$?

(A) $\frac{1}{2} \leq e_{n,y}$

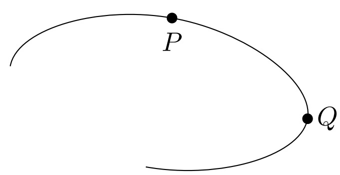
(B) $-\frac{1}{2} \leq e_{n,y} < 0$

(C) $e_{n,y} = 0$

(D) $e_{n,y} < -\frac{1}{2}$

(E) $0 \leq e_{n,y} < \frac{1}{2}$

25. (1 point) A point is moving around the curve shown below with varying speed.



The radius of curvature and speed at P and Q are given by:

$$\rho_P = 4 \text{ m} \qquad \rho_Q = 2 \text{ m}$$
$$v_P = 4 \text{ m/s} \qquad v_Q = 2 \text{ m/s}.$$

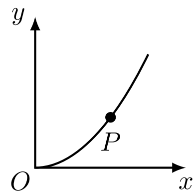
Which of the following is true about the normal accelerations $a_{P,n}$ at P and $a_{Q,n}$ at Q?

(A) $a_{P,n} > a_{Q,n}$

(B) $a_{P,n} = a_{Q,n}$

(C) $a_{P,n} < a_{Q,n}$

26. (1 point) A particle is moving to the right along the curve $y = \frac{1}{3}x^2$ m at a constant speed of $v = \frac{5}{3}$ m/s. What is the horizontal component of velocity v_x when $x = 2$ m?



(A) $0 \text{ m/s} \leq v_x < 2 \text{ m/s}$

(B) $2 \text{ m/s} \leq v_x$

(C) $-2 \text{ m/s} \leq v_x < 0 \text{ m/s}$

(D) $v_x = 0 \text{ m/s}$

(E) $v_x < -2 \text{ m/s}$

27. (1 point) For a certain position P the distance from the origin is $r = 4$ m and the polar basis vectors are:

$$\hat{e}_r = -\frac{1}{2}\hat{\imath} - \frac{\sqrt{3}}{2}\hat{\jmath}$$
$$\hat{e}_\theta = \frac{\sqrt{3}}{2}\hat{\imath} - \frac{1}{2}\hat{\jmath}$$

What is the horizontal coordinate x?

(A) $-2 \text{ m} \leq x < 0 \text{ m}$

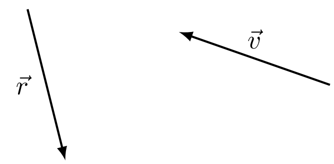
(B) $2 \text{ m} < x$

(C) $x < -2 \text{ m}$

(D) $0 \text{ m} < x < 2 \text{ m}$

(E) $x = 0 \text{ m}$

28. (1 point) The position vector $\vec{r}$ and velocity $\vec{v}$ for a single particle P are shown below at a particular instant.



Which statement about the polar angle derivative $\dot{\theta}$ is true at this instant?

(A) $\dot{\theta} < 0$

(B) $\dot{\theta} = 0$

(C) $\dot{\theta} > 0$

29. (1 point) The vector $\vec{a} = 3\hat{\imath} - 4\hat{\jmath}$ has derivative $\dot{\vec{a}} = -2\hat{\imath} - \hat{\jmath}$. What is the rate of change $\dot{a}$ of the length?

(A) $\dot{a} < -1$

(B) $0 < \dot{a} < 1$

(C) $-1 \leq \dot{a} < 0$

(D) $1 \leq \dot{a}$

(E) $\dot{a} = 0$

30. (1 point) A particle moves so that its position in polar coordinates is given by

$$r = \frac{1}{2}t^2 \text{ m}$$
$$\theta = 2t \text{ rad.}$$

What is the radial component of acceleration a_r at $t = 2$ s?

(A) $0 \text{ m/s}^2 \leq a_r < 7 \text{ m/s}^2$

(B) $7 \text{ m/s}^2 \leq a_r$

(C) $a_r < -7 \text{ m/s}^2$

(D) $a_r = 0 \text{ m/s}^2$

(E) $-7 \text{ m/s}^2 \leq a_r < 0 \text{ m/s}^2$

31. (1 point) A position P has an associated polar basis with

$$\hat{e}_\theta = \frac{1}{\sqrt{2}}\hat{\imath} - \frac{1}{\sqrt{2}}\hat{\jmath}.$$

What is θ?

(A) $\frac{3}{2}\pi \leq \theta < 2\pi$

(B) $\pi \leq \theta < \frac{3}{2}\pi$

(C) $0 \leq \theta < \frac{1}{2}\pi$

(D) $\frac{1}{2}\pi \leq \theta < \pi$

32. (1 point) The particle P has polar coordinates $r = 2$ m, $\theta = -\frac{3}{4}\pi$ rad and rates of change $\dot{r} > 0$ and $\dot{\theta} < 0$. Which statement about the velocity $\vec{v}$ of P must be true?

(A) $v_y < 0$

(B) $v_y \geq 0$

(C) $v_x \geq 0$

(D) $v_x < 0$

33. (1 point) A position P has an associated polar basis with

$$\hat{e}_r = \frac{1}{2}\hat{\imath} + \frac{\sqrt{3}}{2}\hat{\jmath}.$$

What is $\hat{e}_\theta$?

(A) $\hat{e}_\theta = \frac{\sqrt{3}}{2}\hat{\imath} - \frac{1}{2}\hat{\jmath}$

(B) $\hat{e}_\theta = -\frac{\sqrt{3}}{2}\hat{\imath} + \frac{1}{2}\hat{\jmath}$

(C) $\hat{e}_\theta = \frac{\sqrt{3}}{2}\hat{\imath} + \frac{1}{2}\hat{\jmath}$

(D) $\hat{e}_\theta = -\frac{\sqrt{3}}{2}\hat{\imath} - \frac{1}{2}\hat{\jmath}$

34. (1 point) A particle P has position vector and velocity:

$$\vec{r} = 5\hat{\imath} + 2\hat{\jmath} \text{ m}$$
$$\vec{v} = 2\hat{\imath} - 4\hat{\jmath} \text{ m/s.}$$

Is the distance from P to the origin:

(A) increasing

(B) staying the same

(C) decreasing

35. (1 point) A particle P has position vector, velocity, and acceleration given by:

$$\vec{r} = 4\hat{\imath} + 2\hat{\jmath} \text{ m}$$
$$\vec{v} = 2\hat{\imath} - 7\hat{\jmath} \text{ m/s}$$
$$\vec{a} = -3\hat{\imath} - 2\hat{\jmath} \text{ m/s}^2$$

Consider the following statements:

(i) The particle is moving closer to the origin.

(ii) The particle is moving further from the origin.

(iii) The particle is speeding up.

(iv) The particle is slowing down.

Which statements are true?

(A) (i) and (iii)

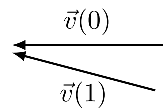
(B) (ii) and (iii)

(C) (i) and (iv)

(D) (ii) and (iv)

(E) none of the other options

36. (1 point) The velocity $\vec{v}(t)$ of a point is shown below at $t = 0$ s and $t = 1$ s.



Which direction is the closest to the direction of the acceleration $\vec{a}(0)$ at time $t = 0$ s?

(A) $\uparrow$

(B) $\downarrow$

(C) $\leftarrow$

(D) $\rightarrow$

37. (1 point) A vector $\vec{a}$ and its derivative $\dot{\vec{a}}$ have $\|\vec{a}\| = 3$, $\|\dot{\vec{a}}\| = 4$, and $\vec{a} \cdot \dot{\vec{a}} = -6$. What can we say about the rate of change of the length of $\vec{a}$ at this instant?

(A) the length of $\vec{a}$ is increasing

(B) the length of $\vec{a}$ is decreasing

(C) the length of $\vec{a}$ is staying the same

38. (1 point) A point has Cartesian coordinates $x = -3$ m, $y = -2$ m. What is its polar coordinate angle θ?

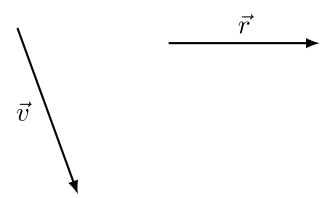
(A) π rad $\leq \theta < \frac{3}{2}\pi$ rad

(B) $\frac{1}{2}\pi$ rad $\leq \theta < \pi$ rad

(C) 0 rad $\leq \theta < \frac{1}{2}\pi$ rad

(D) $\frac{3}{2}\pi$ rad $\leq \theta < 2\pi$ rad

39. (1 point) The position vector $\vec{r}$ and velocity $\vec{v}$ for a single particle P are shown below at a particular instant.



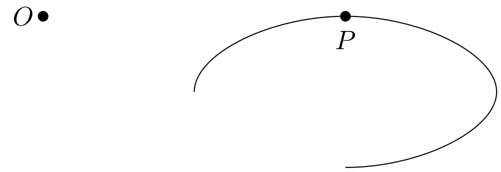
Which statement about $\dot{r}$ is true at this instant?

(A) $\dot{r} = 0$

(B) $\dot{r} > 0$

(C) $\dot{r} < 0$

40. (1 point) A point is moving around the curve shown and is currently at position P. Consider a polar basis $\hat{e}_r, \hat{e}_\theta$ at P from the origin O and a tangential/normal basis $\hat{e}_t, \hat{e}_n$ at P.



Which of the following is true?

(A) $\hat{e}_n = -\hat{e}_r$

(B) $\hat{e}_n = -\hat{e}_\theta$

(C) $\hat{e}_n = \hat{e}_r$

(D) $\hat{e}_n = \hat{e}_\theta$

41. (1 point) A position P has an associated polar basis so that

$$\hat{\imath} = \frac{1}{\sqrt{2}}\hat{e}_r - \frac{1}{\sqrt{2}}\hat{e}_\theta.$$

What is θ?

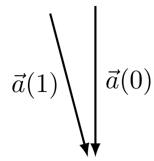
(A) $\pi \leq \theta < \frac{3}{2}\pi$

(B) $\frac{3}{2}\pi \leq \theta < 2\pi$

(C) $\frac{1}{2}\pi \leq \theta < \pi$

(D) $0 \leq \theta < \frac{1}{2}\pi$

42. (1 point) The vector $\vec{a}(t)$ is pictured below at $t = 0$ s and $t = 1$ s.



Which direction is the closest to the direction of $\dot{\vec{a}}(0)$?

(A) $\leftarrow$

(B) $\downarrow$

(C) $\uparrow$

(D) $\rightarrow$

43. (1 point) A point is currently at position $x = 3$ m, $y = 2$ m, $z = 0$ m and is rotating in the x–y plane about the origin with angular velocity $\vec{\omega} = 2\hat{k}$. The velocity $\vec{v}$ of the point is:

(A) $\vec{v} = -4\hat{\imath} + 6\hat{\jmath}$ m/s

(B) $\vec{v} = -4\hat{\imath} - 6\hat{\jmath}$ m/s

(C) $\vec{v} = 4\hat{\imath} - 6\hat{\jmath}$ m/s

(D) $\vec{v} = 4\hat{\imath} + 6\hat{\jmath}$ m/s

44. (1 point) A particle moves so that its position in polar coordinates is given by

$$r = 2t \text{ m}$$
$$\theta = -\frac{\pi}{8}t^2 \text{ rad.}$$

What is the $\hat{\imath}$ component of velocity v_x at $t = 2$ s?

(A) $v_x < -6$ m/s

(B) -6 m/s $\leq v_x < 0$ m/s

(C) $v_x = 0$ m/s

(D) 6 m/s $\leq v_x$

(E) 0 m/s $\leq v_x < 6$ m/s

45. (1 point) The position vector of a particle is given by

$$\vec{r} = (4t^2 - 2)\,\hat{\imath} + (4t^2 - t^3)\,\hat{\jmath} \text{ m.}$$

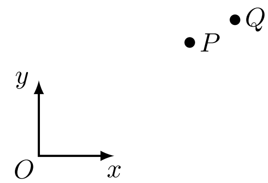
Which statement is true at time $t = 0$?

(A) the $\hat{\jmath}$ component of the particle's velocity is decreasing

(B) the $\hat{\jmath}$ component of the particle's velocity is staying the same

(C) the $\hat{\jmath}$ component of the particle's velocity is increasing

46. (1 point) Points P and Q are moving in circular paths around the origin O with angular velocities ω_P and ω_Q.



The two particles are moving with the same speed. Which statement is true?

(A) $\frac{1}{2}|\omega_Q| < |\omega_P| \leq |\omega_Q|$

(B) $|\omega_P| \leq \frac{1}{2}|\omega_Q|$

(C) $|\omega_Q| < |\omega_P| \leq 2|\omega_Q|$

(D) $2|\omega_Q| < |\omega_P|$

47. (1 point) A spaceship is moving with velocity and acceleration given in a polar basis by

$$\vec{v} = 3\,\hat{e}_r + 4\,\hat{e}_\theta \text{ m/s}$$
$$\vec{a} = -7\,\hat{e}_r - \hat{e}_\theta \text{ m/s}^2.$$

What is the radius of curvature of the spaceship's path?

(A) $0 \text{ m} \leq \rho < 2 \text{ m}$

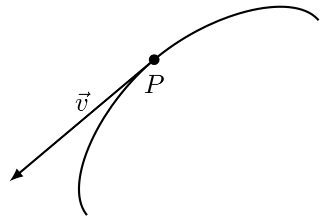
(B) $\rho = 0 \text{ m}$

(C) $6 \text{ m} \leq \rho$

(D) $2 \text{ m} \leq \rho < 4 \text{ m}$

(E) $4 \text{ m} \leq \rho < 6 \text{ m}$

48. (1 point) A car is driving on a curved track with the top view shown below. At a given instant the car is at point P with velocity $\vec{v}$ and its speed is increasing, such that the tangential and normal components of its acceleration are equal in magnitude.



Which direction is the closest to the direction of the acceleration $\vec{a}$ at the instant shown?

(A) $\rightarrow$

(B) $\leftarrow$

(C) $\uparrow$

(D) $\downarrow$

49. (1 point) A point has polar coordinates $r = 4$ m, $\theta = -120°$. What is its horizontal coordinate x?

(A) $x < -2$ m

(B) $2 \text{ m} < x$

(C) $0 \text{ m} < x < 2$ m

(D) $x = 0$ m

(E) $-2 \text{ m} \leq x < 0$ m

50. (1 point) A car is observed moving in the plane with velocity $\vec{v} = 3\hat{\imath} + 2\hat{\jmath}$ and acceleration $\vec{a} = -2\hat{\imath} + 4\hat{\jmath}$. At this instant, is it:

(A) stationary

(B) driving around a curve counterclockwise

(C) driving around a curve clockwise

(D) driving in a straight line