CHAPTER 10 TEST REVIEW MULTIPLE CHOICE PROBLEMS AROUND THE ROOM

1. At time $t \geq 0$, a particle moving in the xy-plane has velocity vector given by $v(t) = \langle t^2, 5t \rangle$. What is the acceleration vector of the particle at time $t = 3$?

(A) $\left\langle 9, \frac{45}{2} \right\rangle$ (B) $\langle 6,5 \rangle$ (C) $\langle 2,0 \rangle$ (D) $\sqrt{306}$ (E) $\sqrt{61}$

2)

A particle moves in the xy-plane with position given by $(x(t), y(t)) = \left(5 - 2t, t^2 - 3\right)$ at time t. In which direction is the particle moving as it passes through the point $(3, -2)$?

(A) Up and to the left

(B) Down and to the left

(C) Up and to the right

(D) Down and to the right

(E) Straight up

3)

Which of the following integrals gives the area of the region that is bounded by the graphs of the polar equations $\theta = 0$, $\theta = \frac{\pi}{4}$, and $r = \frac{2}{\cos\theta + \sin\theta}$?

(A) $\int_0^{\pi/4} \frac{1}{\cos\theta + \sin\theta}\, d\theta$

(B) $\int_0^{\pi/4} \frac{2}{\cos\theta + \sin\theta}\, d\theta$

(C) $\int_0^{\pi/4} \frac{2}{(\cos\theta + \sin\theta)^2}\, d\theta$

(D) $\int_0^{\pi/4} \frac{4}{(\cos\theta + \sin\theta)^2}\, d\theta$

(E) $\int_0^{\pi/4} \frac{2(\cos\theta - \sin\theta)^2}{(\cos\theta + \sin\theta)^4}\, d\theta$

4)

If $x(t) = t^2 + 4$ and $y(t) = t^4 + 3$, for $t > 0$, then in terms of t, $\dfrac{d^2y}{dx^2} =$

(A) $\dfrac{1}{2}$ (B) 2 (C) $4t$ (D) $6t^2$ (E) $12t^2$

5)

If $\dfrac{dy}{dt} = -10e^{-t/2}$ and $y(0) = 20$, what is the value of $y(6)$?

(A) $20e^{-6}$ (B) $20e^{-3}$ (C) $20e^{-2}$ (D) $10e^{-3}$ (E) $5e^{-3}$

6)

Which of the following gives the length of the path described by the parametric equations $x = \sin\left(t^3\right)$ and $y = e^{5t}$ from $t = 0$ to $t = \pi$?

(A) $\int_0^{\pi} \sqrt{\sin^2\left(t^3\right) + e^{10t}}\, dt$

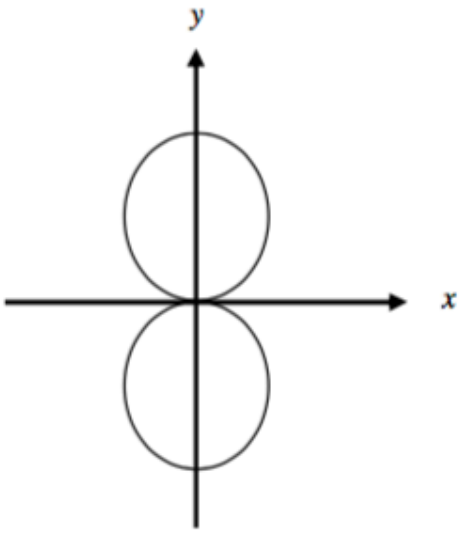
(B) $\int_0^{\pi} \sqrt{\cos^2\left(t^3\right) + e^{10t}}\, dt$

(C) $\int_0^{\pi} \sqrt{9t^4 \cos^2\left(t^3\right) + 25e^{10t}}\, dt$

(D) $\int_0^{\pi} \sqrt{3t^2 \cos\left(t^3\right) + 5e^{5t}}\, dt$

(E) $\int_0^{\pi} \sqrt{\cos^2\left(3t^2\right) + e^{10t}}\, dt$

7)



. Which of the following expressions gives the total area enclosed by the polar curve $r = \sin^2\theta$ shown in the figure above?

(A) $\frac{1}{2}\int_0^{\pi} \sin^2\theta d\theta$

(B) $\int_0^{\pi} \sin^2\theta d\theta$

(C) $\frac{1}{2}\int_0^{\pi} \sin^4\theta d\theta$

(D) $\int_0^{\pi} \sin^4\theta d\theta$

(E) $2\int_0^{\pi} \sin^4\theta d\theta$

8)

For $0 \le t \le 13$ an object travels along an elliptical path given by the parametric equations $x = 3\cos t$ and $y = 4\sin t$. At the point where $t = 13$, the object leaves the path and travels along the line tangent to the path at that point. What is the slope of the line on which the object travels?

(A) $-\frac{4}{3}$

(B) $-\frac{3}{4}$

(C) $-\frac{4\tan 13}{3}$

(D) $-\frac{4}{3\tan 13}$

(E) $-\frac{3}{4\tan 13}$

9)

A curve C is defined by the parametric equations $x = t^2 - 4t + 1$ and $y = t^3$. Which of the following is an equation of the line tangent to the graph of C at the point $(-3,8)$?

(A) $x = -3$

(B) $x = 2$

(C) $y = 8$

(D) $y = -\frac{27}{10}(x+3) + 8$

(E) $y = 12(x+3) + 8$

10) A particle moves in the xy-plane so that its position at any time t is given by $x(t) = t^2$ and $y(t) = \sin(4t)$. What is the speed of the particle when t = 3?

a) 2.909 b) 3.062 c) 6.884 d) 9.016 e) 47.393

11)

The distance traveled by a particle from $t = 0$ to $t = 4$ whose position is given by the vector $\vec{s}(t) = \langle t^2, t \rangle$ is given by

(A) $\int_0^4 \sqrt{4t+1}\,dt$ (B) $2\int_0^4 \sqrt{t^2+1}\,dt$ (C) $\int_0^4 \sqrt{2t^2+1}\,dt$ (D) $\int_0^4 \sqrt{4t^2+1}\,dt$ (E) $2\pi\int_0^4 \sqrt{4t^2+1}\,dt$

ANSWER KEY

1. B (2008 #1)
2. A (2015 #8)
3. C (2015 #15)
4. B (2015 #17)
5. B (2015 #18)
6. C (2008 #5)
7. D (2008 #26)
8. D (2003 #4)
9. A (2003 #17)
10. C (2003 #84)
11. D (yang review)