BC Multiple Choice Chapter 10

1969

1. The asymptotes of the graph of the parametric equations $x=\frac{1}{t}$, $y=\frac{t}{t+1}$ are

(A) $x=0,\ y=0$ (B) $x=0$ only (C) $x=-1,\ y=0$
(D) $x=-1$ only (E) $x=0,\ y=1$

9. The area of the closed region bounded by the polar graph of $r=\sqrt{3+\cos\theta}$ is given by the integral

(A) $\int_0^{2\pi}\sqrt{3+\cos\theta}\,d\theta$ (B) $\int_0^{\pi}\sqrt{3+\cos\theta}\,d\theta$ (C) $2\int_0^{\pi/2}(3+\cos\theta)\,d\theta$

(D) $\int_0^{\pi}(3+\cos\theta)\,d\theta$ (E) $2\int_0^{\pi/2}\sqrt{3+\cos\theta}\,d\theta$

1973

14. If $x=t^2-1$ and $y=2e^t$, then $\frac{dy}{dx}=$

(A) $\frac{e^t}{t}$ (B) $\frac{2e^t}{t}$ (C) $\frac{e^{|t|}}{t^2}$ (D) $\frac{4e^t}{2t-1}$ (E) e^t

40. The area of the region enclosed by the polar curve $r=1-\cos\theta$ is

(A) $\frac{3}{4}\pi$ (B) π (C) $\frac{3}{2}\pi$ (D) 2π (E) 3π

1985

4. A particle moves in the xy-plane so that at any time t its coordinates are $x=t^2-1$ and $y=t^4-2t^3$. At $t=1$, its acceleration vector is

(A) $(0,-1)$ (B) $(0,12)$ (C) $(2,-2)$ (D) $(2,0)$ (E) $(2,8)$

24. The area of the region enclosed by the polar curve $r=\sin(2\theta)$ for $0\le\theta\le\frac{\pi}{2}$ is

(A) 0 (B) $\frac{1}{2}$ (C) 1 (D) $\frac{\pi}{8}$ (E) $\frac{\pi}{4}$

30. If $x=t^3-t$ and $y=\sqrt{3t+1}$, then $\frac{dy}{dx}$ at $t=1$ is

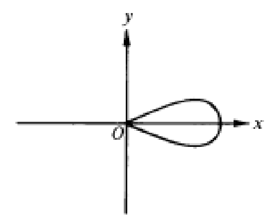
(A) $\frac{1}{8}$ (B) $\frac{3}{8}$ (C) $\frac{3}{4}$ (D) $\frac{8}{3}$ (E) 8

1988

15. For any time $t\ge 0$, if the position of a particle in the xy-plane is given by $x=t^2+1$ and $y=\ln(2t+3)$, then the acceleration vector is

(A) $\left(2t,\frac{2}{(2t+3)}\right)$ (B) $\left(2t,\frac{-4}{(2t+3)^2}\right)$ (C) $\left(2,\frac{4}{(2t+3)^2}\right)$

(D) $\left(2,\frac{2}{(2t+3)^2}\right)$ (E) $\left(2,\frac{-4}{(2t+3)^2}\right)$



23. Which of the following gives the area of the region enclosed by the loop of the graph of the polar curve $r=4\cos(3\theta)$ shown in the figure above?

(A) $16\int_{-\frac{\pi}{3}}^{\frac{\pi}{3}}\cos(3\theta)\,d\theta$ (B) $8\int_{-\frac{\pi}{6}}^{\frac{\pi}{6}}\cos(3\theta)\,d\theta$ (C) $8\int_{-\frac{\pi}{3}}^{\frac{\pi}{3}}\cos^2(3\theta)\,d\theta$

(D) $16\int_{-\frac{\pi}{6}}^{\frac{\pi}{6}}\cos^2(3\theta)\,d\theta$ (E) $8\int_{-\frac{\pi}{6}}^{\frac{\pi}{6}}\cos^2(3\theta)\,d\theta$

34. A curve in the plane is defined parametrically by the equations $x=t^3+t$ and $y=t^4+2t^2$. An equation of the line tangent to the curve at $t=1$ is

(A) $y=2x$ (B) $y=8x$ (C) $y=2x-1$

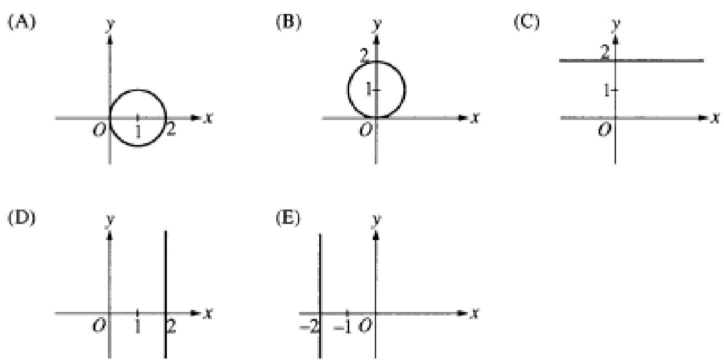
(D) $y=4x-5$ (E) $y=8x+13$

1993

4. A particle moves along the curve $xy = 10$. If $x = 2$ and $\frac{dy}{dt} = 3$, what is the value of $\frac{dx}{dt}$?

(A) $-\frac{5}{2}$ (B) $-\frac{6}{5}$ (C) 0 (D) $\frac{4}{5}$ (E) $\frac{6}{5}$

5. Which of the following represents the graph of the polar curve $r = 2\sec\theta$?



6. If $x = t^2 + 1$ and $y = t^3$, then $\frac{d^2y}{dx^2} =$

(A) $\frac{3}{4t}$ (B) $\frac{3}{2t}$ (C) $3t$ (D) $6t$ (E) $\frac{3}{2}$

23. The length of the curve determined by the equations $x = t^2$ and $y = t$ from $t = 0$ to $t = 4$ is

(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) $2\pi\int_0^4 \sqrt{4t^2+1}\,dt$

25. Consider the curve in the xy-plane represented by $x = e^t$ and $y = te^{-t}$ for $t \geq 0$. The slope of the line tangent to the curve at the point where $x = 3$ is

(A) 20.086 (B) 0.342 (C) -0.005 (D) -0.011 (E) -0.033

1997

2. If $x = e^{2t}$ and $y = \sin(2t)$, then $\frac{dy}{dx} =$

(A) $4e^{2t}\cos(2t)$ (B) $\frac{e^{2t}}{\cos(2t)}$ (C) $\frac{\sin(2t)}{2e^{2t}}$ (D) $\frac{\cos(2t)}{2e^{2t}}$ (E) $\frac{\cos(2t)}{e^{2t}}$

15. The length of the path described by the parametric equations $x = \cos^3 t$ and $y = \sin^3 t$, for $0 \leq t \leq \frac{\pi}{2}$, is given by

(A) $\int_0^{\frac{\pi}{2}} \sqrt{3\cos^2 t + 3\sin^2 t}\,dt$

(B) $\int_0^{\frac{\pi}{2}} \sqrt{-3\cos^2 t\,\sin t + 3\sin^2 t\,\cos t}\,dt$

(C) $\int_0^{\frac{\pi}{2}} \sqrt{9\cos^4 t + 9\sin^4 t}\,dt$

(D) $\int_0^{\frac{\pi}{2}} \sqrt{9\cos^4 t\,\sin^2 t + 9\sin^4 t\,\cos^2 t}\,dt$

(E) $\int_0^{\frac{\pi}{2}} \sqrt{\cos^6 t + \sin^6 t}\,dt$

18. For what values of t does the curve given by the parametric equations $x = t^3 - t^2 - 1$ and $y = t^4 + 2t^2 - 8t$ have a vertical tangent?

(A) 0 only
(B) 1 only
(C) 0 and $\frac{2}{3}$ only
(D) 0, $\frac{2}{3}$, and 1
(E) No value

21. Which of the following is equal to the area of the region inside the polar curve $r = 2\cos\theta$ and outside the polar curve $r = \cos\theta$?

(A) $3\int_0^{\frac{\pi}{2}} \cos^2\theta \, d\theta$ (B) $3\int_0^{\pi} \cos^2\theta \, d\theta$ (C) $\frac{3}{2}\int_0^{\frac{\pi}{2}} \cos^2\theta \, d\theta$ (D) $3\int_0^{\frac{\pi}{2}} \cos\theta \, d\theta$ (E) $3\int_0^{\pi} \cos\theta \, d\theta$

1998

2. In the xy-plane, the graph of the parametric equations $x = 5t + 2$ and $y = 3t$, for $-3 \le t \le 3$, is a line segment with slope

(A) $\frac{3}{5}$ (B) $\frac{5}{3}$ (C) 3 (D) 5 (E) 13

10. A particle moves on a plane curve so that at any time $t > 0$ its x-coordinate is $t^3 - t$ and its y-coordinate is $(2t-1)^3$. The acceleration vector of the particle at $t = 1$ is

(A) $(0,1)$ (B) $(2,3)$ (C) $(2,6)$ (D) $(6,12)$ (E) $(6,24)$

19. The area of the region inside the polar curve $r = 4\sin\theta$ and outside the polar curve $r = 2$ is given by

(A) $\frac{1}{2}\int_0^{\pi} (4\sin\theta - 2)^2 \, d\theta$ (B) $\frac{1}{2}\int_{\frac{\pi}{4}}^{\frac{3\pi}{4}} (4\sin\theta - 2)^2 \, d\theta$ (C) $\frac{1}{2}\int_{\frac{\pi}{6}}^{\frac{5\pi}{6}} (4\sin\theta - 2)^2 \, d\theta$

(D) $\frac{1}{2}\int_{\frac{\pi}{6}}^{\frac{5\pi}{6}} \left(16\sin^2\theta - 4\right) d\theta$ (E) $\frac{1}{2}\int_0^{\pi} \left(16\sin^2\theta - 4\right) d\theta$

21. The length of the path described by the parametric equations $x = \frac{1}{3}t^3$ and $y = \frac{1}{2}t^2$, where $0 \le t \le 1$, is given by

(A) $\int_0^1 \sqrt{t^2 + 1} \, dt$

(B) $\int_0^1 \sqrt{t^2 + t} \, dt$

(C) $\int_0^1 \sqrt{t^4 + t^2} \, dt$

(D) $\frac{1}{2}\int_0^1 \sqrt{4 + t^4} \, dt$

(E) $\frac{1}{6}\int_0^1 t^2 \sqrt{4t^2 + 9} \, dt$

77. If f is a vector-valued function defined by $f(t) = \left(e^{-t}, \cos t\right)$, then $f''(t) =$

(A) $-e^{-t} + \sin t$ (B) $e^{-t} - \cos t$ (C) $\left(-e^{-t}, -\sin t\right)$

(D) $\left(e^{-t}, \cos t\right)$ (E) $\left(e^{-t}, -\cos t\right)$

1969 BC

1. C
2. E
3. B
4. D
5. E
6. B
7. D
8. C
9. D
10. A
11. B
12. E
13. C
14. D
15. B
16. B
17. B
18. E
19. C
20. A
21. B
22. E
23. D
24. C
25. A
26. C
27. C
28. D
29. C
30. D
31. C
32. B
33. A
34. D
35. A
36. B
37. D
38. A
39. D
40. E
41. D
42. B
43. E
44. E
45. E

1973 BC

1. A
2. D
3. A
4. C
5. B
6. D
7. D
8. B
9. A
10. A
11. E
12. D
13. D
14. A
15. C
16. A
17. C
18. D
19. D
20. E
21. B
22. C
23. C
24. A
25. B
26. D
27. E
28. C
29. A
30. B
31. E
32. C
33. A
34. C
35. C
36. E
37. E
38. B
39. D
40. C
41. D
42. D
43. E
44. A
45. E

1985 BC

1. D
2. A
3. B
4. D
5. D
6. E
7. A
8. C
9. B
10. A
11. A
12. A
13. B
14. C
15. C
16. C
17. B
18. C
19. D
20. C
21. B
22. A
23. C
24. D
25. C
26. E
27. E
28. E
29. D
30. B
31. D
32. E
33. C
34. A
35. B
36. E
37. A
38. C
39. A
40. A
41. C
42. E
43. E
44. A
45. D

1988 BC

1. A
2. D
3. B
4. E
5. C
6. C
7. A
8. A
9. D
10. D
11. A
12. B
13. B
14. A
15. E
16. A
17. D
18. E
19. B
20. E
21. D
22. E
23. E
24. D
25. D
26. C
27. B
28. E
29. B
30. C
31. C
32. E
33. E
34. C
35. A
36. E or D
37. D
38. C
39. C
40. E
41. B
42. A
43. A
44. A
45. B

1993 BC

1. A
2. C
3. E
4. B
5. D
6. A
7. A
8. B
9. D
10. E
11. E
12. E
13. C
14. B
15. D
16. A
17. A
18. B
19. B
20. E
21. A
22. B
23. D
24. C
25. D
26. B
27. C
28. A
29. E
30. C
31. A
32. B
33. A
34. E
35. A
36. E
37. B
38. C
39. C
40. C
41. C
42. E
43. A
44. E
45. D

1997 BC

1. C
2. E
3. A
4. C
5. C
6. A
7. C
8. E
9. A
10. B
11. C
12. A
13. B
14. C
15. D
16. B
17. B
18. C
19. D
20. E
21. A
22. C
23. E
24. D
25. A

76. D
77. E
78. A
79. D
80. B
81. D
82. B
83. E
84. C
85. D
86. A
87. B
88. C
89. D
90. B

1998 BC

1. C
2. A
3. D
4. A
5. A
6. E
7. E
8. B
9. D
10. E
11. A
12. E
13. B
14. E
15. B
16. C
17. D
18. B
19. D
20. E
21. C
22. A
23. E
24. C
25. C
26. E
27. D
28. C

76. D
77. E
78. B
79. A
80. B
81. B
82. B
83. C
84. B
85. C
86. C
87. D
88. C
89. A
90. A
91. E
92. D