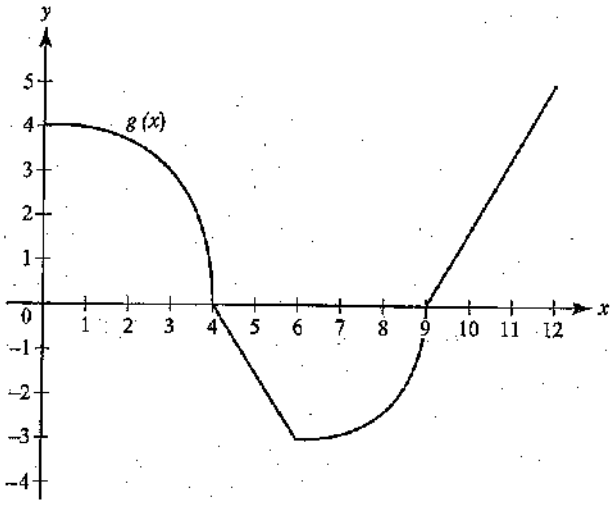
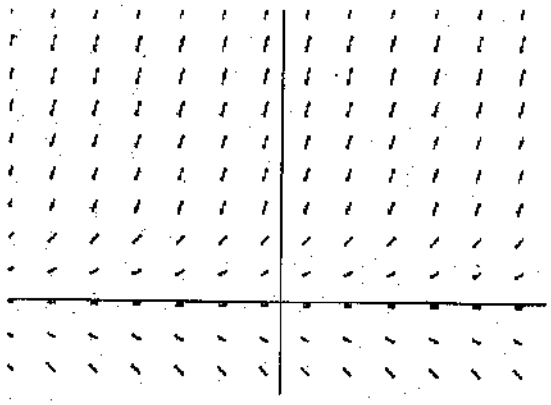
**37.** The graph of $g$, shown below, consists of the arcs of two quarter-circles and two straight-line segments. The value of $\int_0^{12} g(x)\,dx$ is




**(A)** $\pi + 2$ **(B)** $\frac{7\pi}{4} + \frac{9}{2}$ **(C)** $\frac{7\pi}{4} + 8$

**(D)** $7\pi + \frac{9}{2}$ **(E)** $\frac{25\pi}{4} + \frac{21}{2}$

**38.** Which of these could be a particular solution of the differential equation whose slope field is shown here?

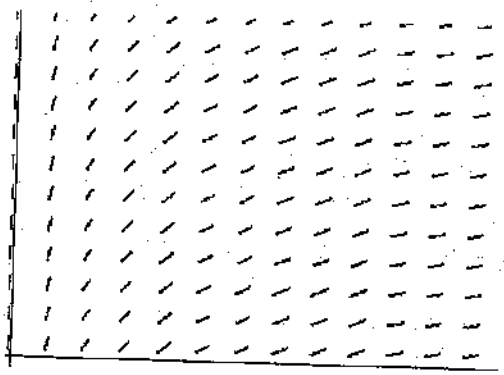


**(A)** $y = \frac{1}{x}$ **(B)** $y = \ln x$ **(C)** $y = e^x$ **(D)** $y = e^{-x}$ **(E)** $y = e^{x^2}$

**39.** What is the domain of the particular solution for $\frac{dy}{dx} = \frac{6x}{x^2 - 4}$ containing the point where $x = -1$?

**(A)** $x < 0$ **(B)** $x > -2$ **(C)** $-2 < x < 2$
**(D)** $x \neq \pm 2$ **(E)** none of these; no solution exists for $x = -1$

40. The slope field shown here is for the differential equation



(A) $y' = \frac{1}{x}$ (B) $y' = \ln x$ (C) $y' = e^x$ (D) $y' = y$ (E) $y' = -y^2$

41. If we substitute $x = \tan\theta$, which of the following is equivalent to $\int_0^1 \sqrt{1+x^2}\,dx$ ?

(A) $\int_0^1 \sec\theta\,d\theta$ (B) $\int_0^1 \sec^3\theta\,d\theta$ (C) $\int_0^{\pi/4} \sec\ \theta\,d\theta$

(D) $\int_0^{\pi/4} \sec^3\theta\,d\theta$ (E) $\int_0^{\tan 1} \sec^3\theta\,d\theta$

42. If $x = 2\sin u$ and $y = \cos 2u$, then a single equation in $x$ and $y$ is

BC ONLY

(A) $x^2 + y^2 = 1$ (B) $x^2 + 4y^2 = 4$ (C) $x^2 + 2y = 2$
(D) $x^2 + y^2 = 4$ (E) $x^2 - 2y = 2$

43. The area bounded by the lemniscate with polar equation $r^2 = 2\cos 2\theta$ is equal to

(A) 4 (B) 1 (C) $\frac{1}{4}$ (D) 2 (E) none of these

44. $\int_{-\infty}^{\infty} \frac{dx}{x^2+1} =$

(A) 0 (B) $\frac{\pi}{2}$ (C) $\pi$ (D) $2\pi$ (E) none of these

45. The first four terms of the Maclaurin series (the Taylor series about $x = 0$) for $f(x) = \frac{1}{1-2x}$ are

(A) $1 + 2x + 4x^2 + 8x^3$ (B) $1 - 2x + 4x^2 - 8x^3$
(C) $-1 - 2x - 4x^2 - 8x^3$ (D) $1 - x + x^2 - x^3$
(E) $1 + x + x^2 + x^3$

46. $\int x^2 e^{-x} dx =$

(A) $\frac{1}{3}x^3e^{-x} + C$ (B) $-\frac{1}{3}x^3e^{-x} + C$ (C) $-x^2e^{-x} + 2xe^{-x} + C$
(D) $-x^2e^{-x} - 2xe^{-x} - 2e^{-x} + C$ (E) $-x^2e^{-x} + 2xe^{-x} - 2e^{-x} + C$