1. \[ \int_{-1}^{2} \frac{1}{\sqrt{4-x^2}} \, dx = \]

(a) \( \pi/3 \)
(b) \( \pi/4 \)
(c) \( -\pi/3 \)
(d) \( 2\pi/3 \)
(e) None of the above.

2. \[ \int_{1}^{e} x \ln x \, dx = \]

(a) \( \int \left( e^2 + 1 \right) \)
(b) \( \int \frac{1}{2} e^2 - \frac{1}{4} \)
(c) \( \int \frac{1}{4} (e^2 - 1) \)
(d) \( e^2 + \frac{1}{2} \)
(e) None of the above.

3. \[ \int \frac{2}{u^2 - 1} \, du = \]

(a) \( \ln \frac{|u + 1|}{|u - 1|} + C \)
(b) \( \ln \frac{|u - 1|}{|u + 1|} + C \)
(c) \( \ln |u^2 - 1| + C \)
(d) \( \sin^{-1} u + C \)
(e) None of the above.

4. Find \( A \) so that \( z = Ae^{2x} \) is a solution of

\[ y'' - 7y' + 12y = 6e^{2x}. \]

(a) \( A = -2 \)
(b) \( A = 4 \)
(c) \( A = 3 \)
(d) \( A = -3 \)
(e) None of the above.
5. The differential equation which has $y^4 = Cx^3 - 3$ as its general solution is:

(a) $y' = \frac{3y^4 + 3}{4xy^3}$

(b) $y' = \frac{y^4 - 9}{3x^2y^4}$

(c) $y' = \frac{3y^4 - 9}{3xy^3}$

(d) $y' = \frac{3y^4 + 9}{4xy^3}$

(e) None of the above.

6. The differential equation which has $y = C_1e^{-x} + C_2e^{2x}$ as its general solution is:

(a) $y'' - 2y' - 3y = 0$

(b) $y'' - y' - 2y = 0$

(c) $y'' + y' - 2y = 0$

(d) $y'' + 2y' + y = 0$

(e) None of the above.

7. The differential equation which has $y = C_1x^4 + C_2x$ as its general solution is:

(a) $y'' - \frac{5}{x}y' + \frac{4}{x^2}y = 0$

(b) $y'' + \frac{4}{x}y' + \frac{4}{x^2}y = 0$

(c) $x^2y'' - 4xy' + 4y = 0$

(d) $x^2y'' - 2xy' + 4y = 0$

(e) None of the above.

8. The differential equation which has $y = C_1 \cos 2x + C_2 \sin 2x$ as its general solution is:

(a) $y'' + 4y = 0$

(b) $y'' - 2y = 0$

(c) $y' - 2y = \cos 2x$

(d) $y'' - 4y = 0$

(e) None of the above.
9. The differential equation which has \( y = C_1 \sin(2x + C_2) \) as its general solution is:

(a) \( y'' + 4y' = 0 \)
(b) \( y' - 2y = \cos 3x \)
(c) \( y'' + 4y = 0 \)
(d) \( y'' - 4y = 0 \)
(e) None of the above.

10. The differential equation which has \( y = C_1 + C_2x + C_3x^2 \) as its general solution is:

(a) \( xy''' - y'' = 0 \)
(b) \( y''' = 0 \)
(c) \( y'' - xy' = 0 \)
(d) \( y'' = 0 \)
(e) None of the above.

11. \( y = C_1x^2 + C_2x^4 \) is the general solution of \( x^2y'' - 5xy' + 8y = 0 \). If \( y = y(x) \) is the solution which satisfies the initial conditions \( y(1) = 4 \), \( y'(1) = 4 \), then \( y(-1) = ? \)

(a) \(-4\)
(b) \(2\)
(c) \(6\)
(d) \(4\)
(e) None of the above.

12. \( y = C_1e^{5x} + C_2e^{-3x} \) is the general solution of \( y'' - 2y' - 15y = 0 \). Find the solution which satisfies the initial conditions \( y(0) = 7 \), \( y'(0) = -5 \).

(a) \( y = 4e^{5x} + 3e^{-3x} \)
(b) \( y = 2e^{5x} + 5e^{-3x} \)
(c) \( y = -2e^{5x} + 9e^{-3x} \)
(d) \( y = 3e^{5x} + 4e^{-3x} \)
(e) None of the above.

13. \( y(x) = 2xe^{-2x} + Ce^{-2x} \) is the general solution of \( y' + 2y = 2e^{-2x} \). If \( y \) is the solution which satisfies the initial condition \( y(0) = -2 \), then \( \lim_{x \to \infty} y(x) = \)

(a) \(-2\)
(b) \(2\)
(c) \(0\)
(d) \(\infty\)
(e) None of the above.