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

   (a) $\pi/3$

   (b) $\pi/4$

   (c) $-\pi/3$

   (d) $2\pi/3$

   (e) None of the above.

2. $\displaystyle \int_{1}^{e} \ln x \, dx =$

   (a) 1

   (b) $e+1$

   (c) 0

   (d) $2e$

   (e) None of the above.

3. $\displaystyle \int \frac{1}{u^2-1}\, du =$

   (a) $2\ln \dfrac{|u+1|}{|u-1|} + C$

   (b) $\ln \sqrt{\dfrac{u-1}{u+1}} + C$

   (c) $\frac{1}{2}\ln |u^2-1| + C$

   (d) $\sin^{-1} u + C$

   (e) None of the above.

4. Find A so that $z = Axe^x$ is a solution of

$$y'' + y' - 2y = 6e^x.$$

   (a) $A = -2$

   (b) $A = 4$

   (c) $A = 3$

   (d) $A = 2$

   (e) None of the above.

5. The differential equation that has $y^3 = Cx^4 - 3x$ as its general solution is:

(a) $y' = \dfrac{4y^3 + 6x}{3xy^2}$

(b) $y' = \dfrac{4y^3 + 9x}{3xy^2}$

(c) $y' = \dfrac{4y^3 - 9}{3xy^2}$

(d) $y' = \dfrac{4y^3 - 9x}{3xy^2}$

(e) None of the above.

6. The differential equation that has $y = C_1 e^x + C_2 e^{-2x}$ as its general solution is:

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

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

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

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

(e) None of the above.

7. The differential equation that has $y = C_1 x^4 + C_2 x^{-2}$ as its general solution is:

(a) $y'' + \dfrac{3}{x} y' - \dfrac{8}{x^2} y = 0$

(b) $y'' - \dfrac{1}{x} y' - \dfrac{8}{x^2} y = 0$

(c) $x^2 y'' - 4xy' - 8y = 0$

(d) $x^2 y'' - 2xy' - 8y = 0$

(e) None of the above.

8. The differential equation that has $y = C_1 \cos 3x + C_2 \sin 3x$ as its general solution is:

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

(b) $y' - 3y = \cos 3x$

(c) $y'' + 9y = 0$

(d) $y'' - 9y = 0$

(e) None of the above.

9. The differential equation that has $y = C_1 \sin(4x + C_2)$ as its general solution is:

    (a) $y'' + 16y' = 0$

    (b) $y' - 4y = \cos 4x$

    (c) $y'' - 16y = 0$

    (d) $y'' + 16y = 0$

    (e) None of the above.

10. The differential equation that has $y = C_1 + C_2 x + C_3 x^2 + x^3$ as its general solution is:

    (a) $y''' = 6$

    (b) $xy''' - y'' = 6x$

    (c) $y'' = 6x$

    (d) $y'' - xy' = 3x^2$

    (e) None of the above.

11. The differential equation that has $y = C_1 + C_2 x^3$ as its general solution is:

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

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

    (c) $y'' - \dfrac{2}{x} y' + \dfrac{1}{x^2} y = 0$

    (d) $y'' - 2xy' = 0$

    (e) None of the above.

12. $y = C_1 e^{5x} + C_2 e^{-3x}$ is the general solution of $y'' - 2y' - 15y = 0$. Find the solution that satisfies the initial conditions $y(0) = 7, y'(0) = 3$.

    (a) $y = 4e^{5x} + 3e^{-3x}$

    (b) $y = -2e^{5x} + 9e^{-3x}$

    (c) $y = 3e^{5x} + 4e^{-3x}$

    (d) $y = e^{5x} + 6e^{-3x}$

    (e) None of the above.

13. The differential equation that has $y = C_1 x^3 + C_2 x^{-1}$ as its general solution is:

(a) $x^2 y'' - 2xy' - 3y = 0$

(b) $y'' + \dfrac{1}{x} y' - \dfrac{3}{x^2} y = 0$

(c) $x^2 y'' + 3xy' - 3y = 0$

(d) $y'' - \dfrac{1}{x} y' - \dfrac{3}{x^2} y = 0$

(e) None of the above.

14. $y = C_1 x^3 + C_2 x^2$ is the general solution of $x^2 y'' - 4xy' + 6y = 0$. If $y = y(x)$ is the solution that satisfies the initial conditions $y(1) = 2$, $y'(1) = 4$, then $y(-1) =$?

(a) -4

(b) 2

(c) 4

(d) 6

(e) None of the above.