

1. The differential equation $y' = x^2y^2$ is

Select all that apply.

- (a) linear
- (b) separable
- (c) exact
- (d) non-linear
- (e) Bernoulli

2. The differential equation $y' + y = x^2$ is

Select all that apply.

- (a) linear
- (b) separable
- (c) exact
- (d) non-linear
- (e) Bernoulli

3. The differential equation $xdy - ydx = 0$ is

Select all that apply.

- (a) linear
- (b) separable
- (c) exact
- (d) non-linear
- (e) Bernoulli

4. The solution of $y' - y = x$ is

Select the correct answer.

- (a) $y = x - 1 + ce^x$
- (b) $y = -x + 1 + ce^x$
- (c) $y = -x - 1 + ce^x$
- (d) $y = -x - 1 + ce^{-x}$
- (e) $y = x + 1 + ce^{-x}$

5. The solution of $x^2ydx + (x^3/3 + y)dy = 0$ is

Select the correct answer.

- (a) $x^3y/3 + y^2/2$
- (b) $x^3y/3 - y^2/2$
- (c) $x^3y/3 + y^2/2 - c$
- (d) $x^3y/3 + y^2/2 = c$
- (e) $x^3y/3 - y^2/2 = c$

6. The solution of $xy' = (x + 1)y^2$

Select the correct answer.

- (a) $y = 1/(x + \ln x + c)$
- (b) $y = 1/(x - \ln x + c)$
- (c) $y = -c/(x + \ln x)$
- (d) $y = -c/(x - \ln x)$
- (e) $y = -1/(x + \ln x + c)$

7. A frozen chicken at $0^\circ C$ is taken out of the freezer and placed on a table at $20^\circ C$. One hour later the temperature of the chicken is $18^\circ C$. The mathematical model for the temperature $T(t)$ as a function of time t is (assuming Newton's law of warming)

Select the correct answer.

- (a) $\frac{dT}{dt} = kT, T(0) = 0, T(1) = 18$
- (b) $\frac{dT}{dt} = k(T - 20), T(0) = 0, T(1) = 18$
- (c) $\frac{dT}{dt} = (T - 20), T(0) = 0, T(1) = 18$
- (d) $\frac{dT}{dt} = T, T(0) = 0, T(1) = 18$
- (e) $\frac{dT}{dt} = k(T - 18), T(0) = 0, T(1) = 18$

8. In the previous problem, the solution of the differential equation is

Select the correct answer.

- (a) $T = Ce^{kt}$
- (b) $T = Ce^{-kt}$
- (c) $T = 20 + Ce^{kt}$
- (d) $T = 20 + Ce^{-kt}$
- (e) $T = 18 + Ce^{kt}$

9. In the previous two problems, the solution for the temperature is

Select the correct answer.

(a) $T(t) = 20 - 20e^{-2.30t}$

(b) $T(t) = 20 - 20e^{2.30t}$

(c) $T(t) = 18 - 18e^{-2.30t}$

(d) $T(t) = 18 - 18e^{2.30t}$

(e) $T(t) = 18e^{-2.30t}$

10. The solution of $y'' + 4y' + 4y = 0$ is

Select the correct answer.

(a) $y = c_1e^{-2x} + c_2xe^{-2x}$

(b) $y = c_1e^{-2x} + c_2e^{-2x}$

(c) $y = c_1e^{2x} + c_2e^{2x}$

(d) $y = c_1e^{2x} + c_2xe^{2x}$

(e) $y = c_1e^{2x} + c_2e^{4x}$

11. The auxiliary equation of $y'' - 5y' + 6y = 0$ is

Select the correct answer.

(a) $m^2 - 5m - 6 = 0$

(b) $m^2 - 5m + 6 = 0$

(c) $m^2 - 5m + 6 = 1$

(d) $m^2 - 5m + 6$

(e) $m^2 - 5m - 6$

12. The solution of $y'' - 5y' + 6y = 0$ is

Select the correct answer.

(a) $y = c_1e^{-2x} + c_2e^{-3x}$

(b) $y = c_1e^{2x} + c_2xe^{3x}$

(c) $y = c_1e^{-2x} + c_2xe^{-3x}$

(d) $y = c_1e^{2x} + c_2e^{3x}$

(e) $y = c_1e^{2x} + c_2e^{-3x}$

13. The solution of $y'' - 4y' + 13y = 0$ is

Select the correct answer.

(a) $y = c_1 e^{-2x} \cos(3x) + c_2 e^{-2x} \sin(3x)$

(b) $y = c_1 e^{-2x} \cos(3x) + c_2 e^{2x} \sin(3x)$

(c) $y = c_1 e^{2x} \cos(3x) + c_2 e^{2x} \sin(3x)$

(d) $y = c_1 e^{2x} + c_2 e^{3x}$

(e) $y = c_1 \cos(3x) + c_2 \sin(3x)$

14. The correct form of the particular solution of $y'' - 2y' + y = e^x$ is

Select the correct answer.

(a) $y_p = Ae^x$

(b) $y_p = Axe^x$

(c) $y_p = Ax^2 e^x$

(d) $y_p = Ax^3 e^x$

(e) none of the above

15. The correct form of the particular solution of $y'' - 2y' = x + e^x$ is

Select the correct answer.

(a) $y_p = Ax + B + Ce^x$

(b) $y_p = (Ax + B + Ce^x)x$

(c) $y_p = Ax^2 + B + Ce^x$

(d) $y_p = Ax^2 + Bx + Ce^x$

(e) $y_p = Ax + B + Cxe^x$

16. The solution of $y'' - 2y' = x + e^x$ is

Select the correct answer.

(a) $y = c_1 + c_2 e^{2x} - x^2/4 - x/4 - e^x$

(b) $y = c_1 + c_2 e^{2x} - x^2/4 - x/4 + e^x$

(c) $y = c_1 + c_2 e^{2x} + x^2/4 - x/4 - e^x$

(d) $y = c_1 + c_2 e^{2x} + x^2/4 + x/4 - e^x$

(e) $y = c_1 + c_2 e^{2x} + x^2/4 + x/4 + e^x$

17. The solution of $y'' + 3y' - 4y = \cos x$ is

Select the correct answer.

- (a) $y = c_1 e^x + c_2 e^{-4x} + (5 \sin x + 3 \cos x)/34$
- (b) $y = c_1 e^x + c_2 e^{-4x} + (-5 \sin x + 3 \cos x)/34$
- (c) $y = c_1 e^x + c_2 e^{-4x} + (-5 \cos x - 3 \sin x)/34$
- (d) $y = c_1 e^x + c_2 e^{-4x} + (5 \cos x + 3 \sin x)/34$
- (e) $y = c_1 e^x + c_2 e^{-4x} + (-5 \cos x + 3 \sin x)/34$

18. The solution of $y'' + y = \tan x$ is

Select the correct answer.

- (a) $y = c_1 \cos x + c_2 \sin x + \cos x \ln |\sec x + \tan x|$
- (b) $y = c_1 \cos x + c_2 \sin x - \cos x \ln |\sec x + \tan x|$
- (c) $y = c_1 \cos x + c_2 \sin x + \cos x \ln |\sec x|$
- (d) $y = c_1 \cos x + c_2 \sin x - \cos x \ln |\tan x|$
- (e) $y = c_1 \cos x + c_2 \sin x - \cos x \ln |\sec x - \tan x|$

19. The solution of $x^2 y'' + xy' = 0$ is

Select the correct answer.

- (a) $y = c_1 + c_2 x^{-1}$
- (b) $y = c_1 \ln x + c_2 x^{-1}$
- (c) $y = c_1 + c_2 \ln x$
- (d) $y = c_1 + c_2 x$
- (e) $y = c_1 + c_2 x^{-2}$

20. The solution of $x^2 y'' + 3xy' - 3y = 0$ is

Select the correct answer.

- (a) $y = c_1 x + c_2 x^{-3}$
- (b) $y = c_1 x^{-1} + c_2 x^3$
- (c) $y = c_1 e^x + c_2 e^{-3x}$
- (d) $y = c_1 e^{-x} + c_2 e^{3x}$
- (e) $y = c_1 x + c_2 x^3$