Question 1: Use any of the Methods for solving the Ordinary Differential Equations as given below.

Solve and graph the solution. Show the details of your work.

12. $x^2y'' - 4xy' + 6y = 0, \quad y(1) = 0.4, \quad y'(1) = 0$

13. $x^2y'' + 3xy' + 0.75y = 0, \quad y(1) = 1,$
$y'(1) = -1.5$

14. $x^2y'' + xy' + 9y = 0, \quad y(1) = 0, \quad y'(1) = 2.5$

15. $x^2y'' + 3xy' + y = 0, \quad y(1) = 3.6, \quad y'(1) = 0.4$

16. $(x^2D^2 - 3xD + 4I)y = 0, \quad y(1) = -\pi, \quad y'(1) = 2\pi$

17. $(x^2D^2 + xD + I)y = 0, \quad y(1) = 1, \quad y'(1) = 1$

18. $(9x^2D^2 + 3xD + I)y = 0, \quad y(1) = 1, \quad y'(1) = 0$

19. $(x^2D^2 - xD - 15I)y = 0, \quad y(1) = 0.1,$
$y'(1) = -4.5$

Use the following Book for solving Q 1:

ERWIN KREYSZIG
ADVANCED ENGINEERING MATHEMATICS

Edition 10

Questions 2:

EXERCISES

1. Use the method of separation of variables to find the general solution to the following differential equations.

   (a) $x' = \sqrt{x}$.

   (b) $x' = e^{-2x}$.

   (c) $y' = 1 + y^2$.

   (d) $u' = \dfrac{1}{5 - 2u}$.

   (e) $x' = au + b, \quad a, b > 0$.

   (f) $Q' = \dfrac{Q}{4 + Q^2}$.

   (g) $x' = e^{x^2}$.

   (h) $y' = r(a - y)$.

2. Solve $y' = r(a - y)$, where r and a are constants.

3. In Exercises 1(a)–(b) find the solution to the resulting IVP when $x(0) = 1$.

4. Find the general solution:

   (a) $x' = \dfrac{2x}{t + 1}$.

   (b) $\theta' = t\sqrt{t^2 + 1}\,\sec\theta$.

   (c) $(2u + 1)u' - (t + 1) = 0$,

   (d) $R' = (t + 1)(R^2 + 1)$.

   (e) $y' + y + \dfrac{1}{y} = 0$.

   (f) $(t + 1)x' + x^2 = 0$,

Use the following Book for solving Q 2:

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A First Course in Differential Equations Third Edition