1. Solve:
   (a) $e^{x^2+y}\,dx + \frac{y}{2x}\,dy = 0$
   (b) $xy^3\frac{dy}{dx} = 1 - x^2 + y^2 - x^2y^2$
   (c) $x^2\,(y+1)\;dx + y^2(x-1)\,dy = 0$

2. Solve:
   (a) $\left[\cos x \tan y + \cos(x+y)\right]\;dx + \left[\sin x \sec^2 y + \cos(x+y)\right]\;dy = 0$
   (b) $(3x^2+4y)\,dx + (4x - y + 1)\;dy = 0$
   (c) $\frac{dy}{dx} = \frac{y+1}{(y+2)e^y - x}$

3. Solve:
   (a) $\left(x^2 + y^2 + 2x\right)\;dx + 2y\,dy = 0$
   (b) $\left(3x^2y^4 + 2xy\right)\;dx + \left(2x^3y^3 - x^2\right)\;dy = 0$

4. Solve:
   (a) $y' + \frac{y}{x} = 4\left(1 + x^2\right)$
   (b) $y' + x\sin 2y = x^3\cos^2 y$
   (c) $\left(x + 2y^3\right)y' = y$
   (d) $\left(xy - \frac{dy}{dx}\right)e^{x^2} = y^3$

5. Find general solutions for each of the following equations.
   (a) $y'' + y' - 6y = 0$
   (b) $y'' - 4y' + 4y = 0$
   (c) $y'' - 4y = 0$
   (d) $y'' - 5y' = 0$

6. Use the method of undetermined coefficients to solve each of the following:
   (a) $y'' + y = x^2 + 2x$
   (b) $y'' + 10y' + 25y = 20e^{-5x}$
   (c) $y'' + y = x\sin x$

7. Use the method of variation of parameters to find solutions for each of the following:
   (a) $y'' + 4y = \tan 2x$
   (b) $y'' + 4y' + 5y = e^{-2x}\sec x$
   (c) $y'' + y = \frac{1}{1+\sin x}$