1. Verify the truth of Stokes’s theorem, in the case when \( V = y\mathbf{i} + 2x\mathbf{j} + zk \), if \( C \) is the circle \( x^2 + y^2 = 1 \) (or \( x = \cos t, y = \sin t \)) in the \( xy \) plane, and \( S \) is the plane area bounded by \( C \).

2. Use Stoke’s Theorem to determine the value of the integral \( \int_C \mathbf{n} \cdot \nabla \times \mathbf{V} \, d\sigma \) over the part of the unit sphere \( x^2 + y^2 + z^2 = 1 \) above the \( xy \) plane, when \( \mathbf{V} = yi \).

3. Use the method of undetermined coefficients to find the complete solution of each of the following ordinary differential equations:

   \[
   (a) \frac{d^2 y}{dx^2} + k^2 y = \sin(x) \text{ (} k^2 \neq 0, 1 \text{)} \quad (b) \frac{d^2 y}{dx^2} - y = e^x \\
   (c) \frac{d^2 y}{dx^2} - y = xe^x
   \]

4. Verify that \( e^x \) satisfies the homogeneous equation associated with \( (x-1)y'' - xy' + y = 0 \), and obtain the general solution.

5. One homogeneous solution of the equation \( (1-x^2)y'' - 2xy' + 2y = 6(1-x^2) \) is \( y = x \). Find the complete solution.