1. Please find the set of differential equations
\[ 2 \frac{dy}{dx} - 3y + x = 4 e^t \]
\[ y + 2\frac{dx}{dt} - 3x = 0 \] (15%)

2. Plane C crosses the intersection of Plan A \((x+2y-3z=0)\) and Plan B \((x-y+z=1)\). In addition, Point A \((1,2,1)\) is in Plane C. Please determine plane C. (15%)

3. Please theory of residues to find the value of \[ \int_{0}^{\infty} \frac{2x^2 - 3}{x^4 + 5x^2 + 4} \, dx \] (15%)

4. Use the Laplace Transformation to solve the boundary value problem
\[ y''+2y'+y=0, \, y(0)=0, \, y(1)=2 \] (15%)

5. Please find the principal stresses \(\sigma_1, \sigma_2, \sigma_3\) and their orientations to a stress state
\(\sigma_{xx} = \sigma_{yy} = \sigma_{zz} = 60\text{MPa}, \, \sigma_{xy} = \sigma_{yx} = 20\text{MPa}, \, \sigma_{xz} = \sigma_{zx} = \sigma_{yz} = \sigma_{zy} = 0\). (20%)

6. For an isotropic, homogeneous elastic body in plane strain with no body forces, the stress components \(\sigma_{ij}\) \((i,j=x,y)\) satisfy the following relation
\[ \frac{\partial \sigma_{xx}}{\partial x} + \frac{\partial \sigma_{xy}}{\partial y} = 0 \]
\[ \frac{\partial \sigma_{yx}}{\partial x} + \frac{\partial \sigma_{yy}}{\partial y} = 0 \]
\[ \left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)(\sigma_{xx} + \sigma_{yy}) = 0 \]
Try to show that (1) the stress components can be expressed in terms of one stress function \(\Phi\) and (2) this stress function is biharmonic. (20%)