1. Please solve for $y=y(x)$. (15%)

　　(a) $xyy' = 2y^2 + 3x^2$ (5%)

　　(b) $y'' + 0.4y' + 9.04y = 0$ (5%)

　　(c) $x^2 y'' - 5xy' + 9y = 0$ (5%)

2. The ODE equation: $y^2 dx + (1+xy)dy = 0$ (15%)

　　(a) Verify the ODE is not exact. (5%)

　　(b) Find the integrating factor $I(x,y)$. (5%)

　　(c) Find the solution of the ODE. (5%)

3. Solve $y'' - 4y' + 3y = \sin 2x$ (10%)

4. Laplace equation: (10%)

　　(a) If (a) $f(t) = \sin(wt + \theta_0)$, Find $L[f(t)]$ ，

　　(b) $F(S) = \dfrac{1}{S(S^2 + 5)}$, Find $L^{-1}[F(S)]$

5. Consider the curve given by parametric equation : x=cost , y=sint , z=3t (15%)

　　　　For $0 \leq t \leq 2\pi$, Please find

　　(a) Position vector F (2%)

　　(b) Tangent vector T (3%)

　　(c) Total length L of this curve (10%)

6. Find the surface integral $\iint_{\Sigma} Z \cdot d\sigma$ with Σ that part of the plane

　　x + y + z=4 lying above the rectangle $0 \leq x \leq 2$, $0 \leq y \leq 1$.(15%)

7. Find the inverse of A = $\begin{pmatrix} 2 & 2 & 0 \\ -2 & 1 & 1 \\ 3 & 0 & 1 \end{pmatrix}$ (10%)

8. Find the eigenvalues and eigenvectors of A = $\begin{pmatrix} 6 & -1 \\ 5 & 4 \end{pmatrix}$ (10%)