

1. (10%) 解 $y' = -2xy$, $y(0) = 1$
2. (10%) 解 $(x^3 + 3xy^2)dx + (3x^2y + y^3)dy = 0$
3. (10%) 解 $y' - y = e^{2x}$
4. (10%) 解 $100y'' + 20y' + 401y = 0$, $y(0) = 0$, $y'(0) = 2$
5. (10%) 解 $y'' + 2y' + y = e^{-x}$, $y(0) = -1$, $y'(0) = 1$
6. (10%) 求下式拉普拉斯轉換

$$\sin^2(t)$$

7. (10%) 解 $y(t) = t + \int_0^t y(\tau) \sin(t - \tau) d\tau$
8. (10%) 以拉普拉斯法解 $y'' - 3y' + 2y = 4t$, $y(0) = 1$, $y'(0) = -1$
9. (20%) 求下列矩陣之特徵值與特徵向量

$$A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$$