1 Question 1

- First Order, Linear, Non-Homogenous
- First Order, Linear, Homogenous
- Third Order, Non-Linear, Non-Homogenous
- Fourth Order, Non-Linear, Non-Homogenous

2 Question 2

2.1 (i)

$$\cos^2 t \cdot \frac{d\theta}{dt} + \cos^2 \theta = 0 \implies \frac{d\theta}{\cos^2 \theta} = -\frac{dt}{\cos^2 t}$$

$$\int \frac{d\theta}{\cos^2 \theta} = -\int \frac{dt}{\cos^2 t} \implies \tan\theta = -\tan t + C$$

$$\text{When t} = \frac{\pi}{4},\ \theta = \frac{\pi}{4} \implies C = 2$$

2.2 (ii)

$$\frac{dy}{dx} + 2x(y+1) = 0 \implies \frac{dy}{y+1} = -2x \cdot dx$$

$$\int \frac{dy}{y+1} = -2\int x \cdot dx \implies \ln|y+1| = -x^2 + C$$

$$y + 1 = e^{-Cx^2}$$