Homework 2

1. Solve the differential equations

$$
\begin{aligned}
&y' + 3y = t + e^{-2t},\\
&y' + y = 5\sin(2t),\\
&x\frac{dy}{dx} - y = x^2 \sin x,\\
&x^2 y' + x(x+2)y = e^x,\\
&(\cos x)y' + (\sin x)y = 1.
\end{aligned}
$$

2. Solve the initial value problems

$$
\begin{aligned}
&y' + \frac{2}{t}y = \frac{\cos t}{t^2}, \quad y(\pi) = 0, \quad t > 0,\\
&ty' + (t+1)y = 2te^{-t}, \quad y(1) = 3, \quad t > 0.\\
&ty' + y = e^t, \quad y(1) = 2,\\
&y' - (\sin x) = 2\sin x, \quad y(\pi/2) = 1,\\
&(x+1)y' + y = \ln x, \quad y(1) = 10.
\end{aligned}
$$