Solve Q3,8,10,14.

1. $y' + 4y = e^{-4t}, y(0) = 2$
2. $y' - y = 1 + te^{t}, y(0) = 0$
3. $y' + y = f(t),\ y(0) = 0$ where $f(t) = \begin{cases} 0, & 0 \le t < 1 \\ 5, & t \ge 1 \end{cases}$
4. $y' + y = f(t),\ y(0) = 0$ where $f(t) = \begin{cases} 1, & 0 \le t < 1 \\ -1, & t \ge 1 \end{cases}$
5. $y' + 2y = f(t),\ y(0) = 0$ where $f(t) = \begin{cases} t, & 0 \le t < 1 \\ 0, & t \ge 1 \end{cases}$

6. $xy' + y = e^x, \qquad y(1) = 2$

7. $yx' - x = 2y^2, \qquad y(1) = 5$

8. $y' + 2y = f(x), \qquad y(0) = 0 \text{ , where } f(x) = \begin{cases} 1, & 0 \le x \le 3 \\ 0, & x > 3 \end{cases}$

9. $y' + y = f(x), \qquad y(0) = 1, \text{ where } f(x) = \begin{cases} 1, & 0 \le x \le 1 \\ -1, & x > 1 \end{cases}$

10. $y' - 3y = -12y^2; y(0) = 2$

11. $y' + \pi y = 2bcos(\pi x); y(0) = 0$

12. $y' + 3y = 5e^{2x} - 6; \quad y(0) = 2$

13. $y' + \frac{2}{x+1}y = 3; \quad y(0) = 5$

14. Consider the equation from the class slides: $\tau \frac{d(q_{o1})}{dt} + q_{o1} = 0$. Show that if τ a function of q_{01} the equation does not qualify for being a linear one. Use $\tau = q_{01}$ to show this.