2. Neither

4. linear

6. linear

8. $\frac{dy}{dx} - \frac{1}{x}y = 2x+1$

$\mu(x) = e^{-\int \frac{1}{x}dx} = e^{-\ln|x|}$

$= e^{\ln \frac{1}{|x|}} = \frac{1}{|x|} = \pm\frac{1}{x}$

choose $\mu(x) = \frac{1}{x}$

$\therefore \frac{d}{dx}\left[\frac{1}{x}y\right] = \frac{1}{x}(2x+1)$

$= 2 + \frac{1}{x}$

$\therefore \frac{1}{x}y = \int (2+\frac{1}{x})dx$

$= 2x + \ln|x| + c$

$\therefore$ $y = 2x^2 + x\ln|x| + cx$

17. $\frac{dy}{dx} - \frac{1}{x}y = xe^x$

$\mu(x) = e^{\int -\frac{1}{x}dx} = e^{-\ln|x|}$

$= \frac{1}{|x|} = \pm\frac{1}{x}$

choose $\mu(x) = \frac{1}{x}$

$\therefore \frac{d}{dx}\left[\frac{1}{x}y\right] = \frac{1}{x}(xe^x)$

$= e^x$

$\frac{1}{x}y = e^x + c$

$\therefore y = xe^x + cx$

$y(1) = e-1 \rightarrow e-1 = e+c$

$\therefore c = -1$

$\therefore$ $y = xe^x - x$

(for $x \in (0,\infty)$)