Extra Problems on Differential Equations

Solve the following initial value problems:

1.
$$e^{y-2} - \frac{dy}{dx}e^{x+2y} = 0$$
 with $y(0) = -2$
2. $(x+1)\frac{dy}{dx} + 2y = x$ with $y(0) = 1$
3. $x\frac{dy}{dx} + 2y = x^2 + 1$ with $y(1) = 1$
4. $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 3y = 0$ with $y(0) = 2$ and $y'(0) = -2$
5. $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 4y = 0$ with $y(0) = 0$ and $y'(0) = 7$
6. $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} = 4x$ with $y(0) = 1$ and $y'(0) = -3$
7. $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = 3e^{2x}$ with $y(0) = -2$ and $y'(0) = -2$
8. $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 5y = 4e^{-x}$ with $y(0) = 1$ and $y'(0) = -\frac{1}{2}$

Solve the following differential equations:

- 1. $e^{x} \frac{dy}{dx} + 2e^{x}y = 1$ 2. $x \frac{dy}{dx} + 3y = \frac{\sin x}{x^{2}}$ 3. $(x - 1)^{3} \frac{dy}{dx} + 4(x - 1)^{2} y = x + 1$ 4. $\frac{d^{2}y}{dx^{2}} + y = \cos x$ 5. $\frac{d^{2}y}{dx^{2}} - \frac{dy}{dx} = \sin x$
- 6. $\frac{d^2y}{dx^2} \frac{dy}{dx} 2y = 20\cos x$