Print your name: _____

Answer each question completely. You must justify your answers to get credit. Even a correct answer with no justification will get no credits. The problem is worth 10 points.

1. Solve the initial-value problem
$$y'' + y' - 2y = 0, \quad y(0) = 0, \quad y'(0) = 2.$$

Char eqn: $r^2 + r - 2 = 0$.

$$r = -\frac{1}{2} \pm \sqrt{\frac{1}{4} + 2} = -\frac{1}{2} \pm \sqrt{\frac{9}{4}} = -\frac{1}{2} \pm \frac{3}{2}$$

$r_1 = 1, \quad r_2 = -2$

General sol is $y(x) = C_1 e^x + C_2 e^{-2x}$.

Initial conditions:

$y(0) = C_1 e^0 + C_2 e^0 = \boxed{C_1 + C_2 = 0}$

$y'(x) = C_1 e^x - 2 C_2 e^{-2x}$

$y'(0) = C_1 e^0 - 2 C_2 e^0 = \boxed{C_1 - 2C_2 = 2}$

$C_1 = -C_2 \implies -C_2 - 2C_2 = -3C_2 = 2$

$\implies \boxed{C_2 = -\frac{2}{3}}$

$\implies \boxed{C_1 = \frac{2}{3}}$

Specific solution is

$$\boxed{y(x) = \frac{2}{3} e^x - \frac{2}{3} e^{-2x}}$$