Math 3280 Worksheet 26:

Group members (2 to 4): _____

(1) Rewrite the initial value problem $y(0) = 1$, $y'(0) = 2$, $y''(0) = 0$, $y''' + y'' - xy' = x$ as an equivalent first-order system.

(2) Suppose a swinging door is damped so that angle of the door (relative to the wall its in) satisfies the differential equation:

$$\theta'' + 2\theta' + \theta = 0$$

for $0 \leq \theta \leq \pi$ (derivatives are with respect to time t).

Initially the door is open at an angle of $\theta(0) = \pi/2$. If it is pushed shut with an initial velocity of $\theta'(0) = v_0 < 0$, for what values of v_0 will the door actually close completely ($\theta = 0$) in finite time?