

## 1.2 Initial value problems

$$\begin{cases} \frac{dy}{dx} = f(x, y) \\ y(x_0) = y_0 \end{cases}$$

$$\begin{cases} \frac{d^2y}{dx^2} = f(x, y, y') \\ y(x_0) = y_0 \\ y'(x_0) = y_1 \end{cases}$$

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1.2 page 2

ex:  $y = ce^{3x}$  is a "one-parameter"  
family of solutions to

$$\frac{dy}{dx} = 3y$$

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Find a value of the  
parameter  $c$  for which

$$y = ce^{3x}$$

solves the I.V.P.

$$\begin{cases} \frac{dy}{dx} = 3y \\ y(0) = 7 \end{cases}$$

1.2 page 3

The two parameter family  
 $y = c_1 e^{2x} + c_2 e^{3x}$  solves

$$y'' - 5y' + 6y = 0.$$

Find values of  $c_1, c_2$  so that  
 $y = c_1 e^{2x} + c_2 e^{3x}$  solves the

$$\text{I.V.P. } \begin{cases} y'' - 5y' + 6y = 0 \\ y(0) = 1 \\ y'(0) = 4 \end{cases}$$