5 Minute Mathematics Break.

Convert the third order equation for $x(s)$ below into a first order system:

$$\frac{d^3x}{ds^3} + e^s \frac{dx}{ds} + x^2 = 0$$

Do not try to solve the problem in either form.

Ex Find the general solution of
$$y'' - 2y' - 2y = 0.$$

Ex Solve the IVP
$$y'' + 3y' + 2y = 0 \quad \text{with} \quad y(0) = 1, \; y'(0) = -1.$$

Ex Solve the IVP
$$y'' - 6y' + 9y = 0 \quad \text{with} \quad y(0) = -1, \; y'(0) = 1.$$

Ex Solve the IVP
$$y'' + 2y' + 5y = 0 \quad \text{with} \quad y(0) = 1, \; y'(0) = -1.$$

Ex Solve the IVP
$$y'' + 9y = 0 \quad \text{with} \quad y(0) = 0, \; y'(0) = 3.$$

5 Minute Mathematics Break.

$y_1(t)$ and $y_2(t)$ both solve the following <u>linear</u>, <u>homogeneous</u> second order DE:

$$y'' + a(t) y' + b(t) y = 0.$$

$$y_1(t) = e^{-t} \sin t$$

$$y_2(t) = e^{-t} \cos t.$$

If $y(0) = 1$ and $y'(0) = 1$, what is the value $y(1)$?