Wednesday 9/19 - Higher Order Equations.

A 2^{nd}-order homogeneous linear equation is

$$A(x)\, y'' + B(x)\, y' + C(x)\, y = 0. \quad (\star)$$

A non-homogeneous equation would have $= F(x)$.

Superposition: If y_1 & y_2 solve $(\star)$ then so does $c_1 y_1 + c_2 y_2$ $\forall c_1, c_2 \in \mathbb{R}$

"for all".

Two (solutions) are linearly independent if neither is a constant multiple of the other.

Ex. $\sin x$ & $\cos x$ $\sin 2x$ & $\sin x \cos x$

x & e^x e^x & e^{x-217}

L. I.   not L. I.

We can tell with the Wronskian:

$$W(f, g) = f'g - fg'.$$

It is not $0 \iff f, g$ are L. I.

Once we have two L.I. solutions to $(\star)$ we can build a general solution and get a solution to any initial condition

$$y(0) = \_ \qquad y'(0) = \_ .$$

Key: This is an algebraic statement about solving linear systems of equations.