MATH225 - 2025-02-28

#notes #math225 #math

## Still doing second order homogeneous

* Which were, to recap, of the form
* From the characteristic equation, we can end up with two real roots and , which gives you the general solution
  + You can also end up with one real (repeated) root, , which pops out the general solution
* We can also have complex conjugate roots!

#### Leading in with an example

* Soooo... we're going to use the characteristic equation.
* That looks rather the far side of factorable, so we're going to pop in ol tried and true, the quadratic formula
* So our solution then becomes the properly ugly
* This is certainly an answer of all time. However, we won't write our answers with these complex shenanigans.
* If you suppose the characteristic equation is , then
* Since these two functions are linearly independent, sums and/or differences of these terms are also solutions to the differential equation.
  + For example, is a solution that gives you
    - That's, believe it or not, a form of cosine. Go tap ol' Euler in MATH225 - 2025-02-24
      * You get things like
    - So this becomes
  + So if we then have
    - and then
    - Which then gives you
* So then combing together the general solution is going to be
* Complex conjugate roots will be written as