Solving Cauchy-Euler equations

While the method describe here works for higher order Cauchy-Euler equations, we focus our efforts on order 2, whereas before, we have the quadratic formula at our disposal. Thus, consider the Cauchy-Euler equation

$$ax^2y'' + bxy' + cy = 0,$$

where a, b, and c are constants. Plugging in $y = x^m$ gives

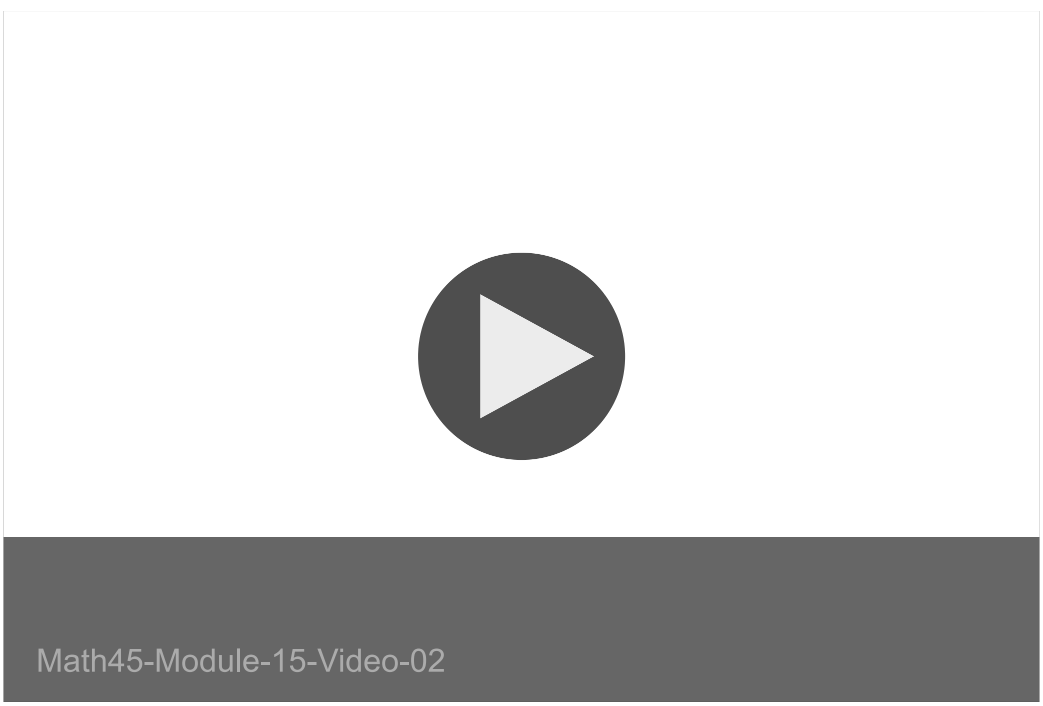
$$x^m(am(m-1) + bm + c) = 0,$$

and this means $am^2 + (b-a)m + c = 0$. From here, there are three possibilities:

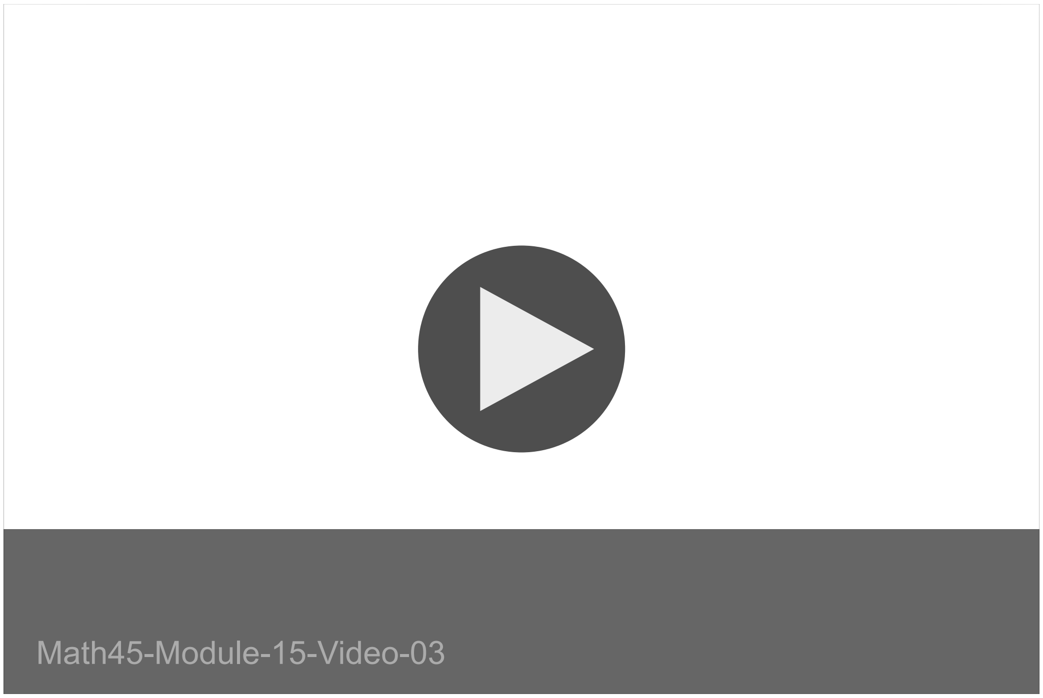
- two distinct real roots,
- one real root that is repeated, or
- two complex roots (which are conjugates).

We examine how all three of these cases plays out in the video below. Note, however, that here we omit examining the case of two complex roots.

Discussion, comments, and examples:



An additional example:



WeBWorK module 15 exercises:

- Problems 2, 3, 4, 5, 6

Relevant Wikipedia articles:

- **[Solving Cauchy-Euler equations](https://en.wikipedia.org/wiki/Cauchy%E2%80%93Euler_equation#Second_order_%E2%80%93_solving_through_trial_solution)** **(https://en.wikipedia.org/wiki/Cauchy%E2%80%93Euler_equation#Second_order_%E2%80%93_solving_through_trial_solution)**