Math 333
Summary of Results: Second-Order Linear Homogeneous DE's with Constant Coefficients

Consider the second-order linear homogeneous differential equation with constant coefficients:

$$ay'' + by' + cy = 0, \tag{1}$$

where a, b, and c are real constants with $a \neq 0$. To find the general solution of Eqn. (1), we first solve the characteristic equation:

$$ar^2 + br + c = 0. \tag{2}$$

1. Suppose that the characteristic equation has two **real and distinct roots** r_1 and r_2. Then the general solution of the differential equation in Eqn. (1) is:

2. Suppose that the characteristic equation has two **complex conjugate roots** $r_1 = \lambda + i\mu$ and $r_2 = \lambda - i\mu$. Then the general solution of the differential equation in Eqn. (1) is:

3. Suppose that the characteristic equation has a **repeated real root** $r_1 = r_2 = -b/2a$. Then the general solution of the differential equation in Eqn. (1) is: