Mathematics 352
Introduction to complex numbers

March 15, 2013 Name: _____

Due: March 18, 2013

Introduction. In this worksheet, you will investigate some problems in complex algebra arising from second-order ODEs.

1. Find the roots of the characteristic equation for the differential equation $y'' + y' + y = 0$. Note that the discriminant is negative, so they are complex. Call them r_1 and r_2.

2. Evaluate $(r_1 + r_2)/2$ and $(r_1 - r_2)/2i$. What do you notice?

3. What complex exponential functions solve the differential equation? Use the roots you found and ape the exponential trick from before.

4. Write these functions using Euler's formula. Call them y_1 and y_2 in their new, Eulerified form.

5. Write down $(y_1 + y_2)/2$ and $(y_1 - y_2)/2i$ and simplify. What do you notice?

Have a great weekend!