

MATH 271, HOMEWORK 1  
DUE SEPTEMBER 6<sup>TH</sup>

**Problem 1.** Look up how to do *integration by parts*. Use this technique to compute the integral

$$\int te^{3t} dt.$$

**Problem 2.** Convert the following numbers in Cartesian coordinates to polar coordinates and compute all pairwise products.

(a)  $z_1 = \frac{1}{2} - \frac{1}{2}i$ ;

(b)  $z_2 = -1 + 3i$ ;

(c)  $z_3 = -2 - 3i$ .

**Problem 3.** Find the square roots of  $-i$  using a geometrical argument.

**Problem 4.** Draw the unit circle in the complex plane. Plot the complex numbers  $z_1$ ,  $z_2$ , and  $z_3$  given above and find their inverses. Explain what taking the inverse does geometrically.

**Problem 5.** Look up a differential equation in chemistry that interests you. Write it down, and explain what it attempts to model.

**Problem 6.** What is a differential equation? What does it mean for a function to be a solution to a differential equation?