# Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

#### ECE 6382

#### Engineering Analysis I

**Exam 1**

#### Nov. 8, 2017

1. This exam is open-book and open-notes. Calculators are allowed. Cell phones are not allowed. Laptops are allowed but they must not be used to access the Internet during the exam. They can only be used to display material such as the class notes that you already have stored on your laptop.
2. Show all of your work. No credit will be given if the work required to obtain the solutions is not clearly shown.
3. Perform all your work on the exam in the space allowed.
4. Write neatly. You will not be given credit for work that is not **easily** legible.
5. Circle your final answers.

Problem 1 (25 pts.)

Evaluate the following Cauchy principal value integral by using complex analysis:

.

Note that there are poles on the real axis, so the integral is defined in the Cauchy principal value sense.

**Room for Work**

Problem 2 (25 pts.)

Evaluate the following integral using complex analysis:

.

**Room for Work**

Problem 3 (25 pts.)

Consider the geometry shown below. It consists of two semi-infinite metal plates, one for *x* > 0 and one for *x* < 0. The geometry is infinite in the *z* direction. Note that there is an insulating gap at the origin.

a) Use conformal mapping to solve for the potential in the region *y* > 0. As part of your solution, draw carefully what the geometry looks like in the *w* plane.

b) Solve for the surface charge density on the upper surface of the metal plate for *x* > 0.

Hint: Consider the mapping *w* = ln (*z*).

**Room for Work**

Problem 4 (25 pts.)

Consider the function

.

Find the complete Laurent series expansion for the functionthat is valid in the region.

**Room for Work**