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

#### ECE 6382

#### Engineering Analysis I

**Exam 1**

#### Nov. 14, 2022

1. This exam is open-book and open-notes. Calculators are allowed. Computers are allowed as long as they are in “airplane” mode and are not used to communicate in any way with anyone. Cell phones or any other devices that have communication functionality are not allowed.
2. Show all of your work. No credit will be given if the work required to obtain the solutions is not clearly shown.
3. Please perform all your work on the exam in the space allowed if possible, though you can attach extra pages if necessary.
4. Please write neatly. You will not be given credit for work that is not **easily** legible.
5. Circle your final answers.

**Problem 1 (25 pts.)**

a) Give the first three terms of the Taylor series of the following function expanded about the point *z* = 0:

.

Also, indicate what the radius of convergence is for the Taylor series.

Note: Do not use the “calculus formula” to get the coefficients of the Taylor series.

b) Give the first three terms of the Laurent series of the following function expanded about the point *z* = 1:

.

Also, indicate what the region of convergence is for the Laurent series.

**Room for Work**

**Room for Work**

**Problem 2 (25 pts.)**

Evaluate the following integral:

.

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Problem 3 (25 pts.)

Consider the following function:

.

On the top sheet, we have. The branch cut is chosen to be along the negative real axis.

Evaluate the integral



where

.

(a) Use path *C*1 shown below.

(b) Use path *C*2 shown below.

(c) Use path *C*3 shown below.

(d) Use path *C*4 shown below.

(e) Use path *C*5 shown below.

Put your answers in rectangular format, keeping at least 6 significant figures.



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Problem 4 (25 pts.)

Consider the mapping

.

This function will map between two regions as shown below.





Use this mapping to solve for the potential  inside of the following geometry.



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