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

#### ECE 6382

#### Engineering Analysis I

**Exam 1**

#### Nov. 11, 2019

1. This exam is open-book and open-notes. Calculators are allowed. Laptops and cell phones (or any 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. Perform all your work on the exam in the space allowed.
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.)**

Find the residues of the following functions at the origin:

(a) 

(b) 

(c) 

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**Problem 2 (25 pts.)**

Consider the following function:

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a) Derive the first three terms of the Taylor series in the region , expanding about the point .

b) Derive the first three terms of the Laurent series in the region , expanding about the point .

c) Derive the first three terms of the Laurent series in the region , expanding about the point .

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**Problem 3 (25 pts.)**

Evaluate the following integrals:

a) 

b) 



c) 

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Problem 4 (25 pts.)

Consider the semi-infinite parallel-plate structure shown below (the same structure that was considered in the class notes).

Drive an expression for the magnitude of the electric field along the center of the structure (the horizontal centerline, at *y* = 0), as a function of *x*. That is, drive an expression for .

You may leave your answer in terms of the variable *u*, as long as you clearly relate *u* to *x* for points along the centerline.

(Hint: consider what happens when you set *v* = 0 in the mapping.)



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