MATH 3160-001 EXAM I

Instructions:. There are 4 problems worth 15 points each. Show your work for full credit. No calculators are allowed. You may use one side of an 8 by 11 inch sheet of notes.

1a. Express the number z = -8i, in polar form $re^{i\theta}$ where θ is the principle argument of z.

b. Find the cube roots of z and plot them.

2. Let $f(z) = e^{-z}$ and let R be the rectangle: $0 \le x \le 2$, $0 \le y \le \pi/4$. Sketch R. Find and sketch the region onto which R is transformed by f(z).

3. Let $f(z) = |z|^2 z$.

a. Express f(z) in terms of it's real and imaginary parts.

b. Write down the Cauchy Riemann Equations for f, and determine at which points f is complex differentiable.

- **4.** Let $f(z) = i^z$ where the principle branch of the logarithm is used (that is $f(z) = e^{zLogi}$).
- **a.** Compute f(i).
- **b.** Find f'(z).
- **c.** Express f(z) in terms of it's real and imaginary parts.