MAT 334 Practice Exam 2

You have 50 minutes. Answer 4 of the following 5 questions. If you answer all 5, your score will be determined by the best 4 solutions you provide.

Problem 1. (Fall 2012, Final Exam) *Does the following limit exist:*

$$\lim_{z\to 0} z^{-1}\operatorname{Log}(1-z)?$$

If so, find the limit; otherwise, show that the limit does not exist.

Problem 2. *Compute the following line integral:*

$$\int_{|z-2|=1} \frac{dz}{z^2-2z+iz-2i}.$$

Assume that the curve in the line integral is positively oriented.

Problem 3. (Fall 2012, Midterm 2) *For which $z\in\mathbb{C}$ is the function $f(z)=|z|^2$ (complex) differentiable? For which $z\in\mathbb{C}$ is f not differentiable?*

Problem 4. (Fall 2012, Final Exam) *For the (analytic) function*

$$f(z)=\frac{1}{z^2-4z+4},$$

find its power series representation about 0, and find its radius of convergence.

Problem 5. (Fall 2012, Midterm 2) *Let γ be any smooth piecewise continuous curve from $-i$ to i that does not pass through the* positive real axis $[0,\infty)$. *Compute*

$$\int_\gamma \frac{1}{z}dz.$$

(Hint: The answer is **not** $+\pi i$*).*