Math 120A
Midterm Exam 2
August 29, 2013
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Instructions

1. **You may use any type of calculator, but no other electronic devices during this exam.**
   - **Express numbers symbolically (for example, $\sqrt{2}$ rather than 2.1).**
2. **You may use one page of notes, but no books or other assistance during this exam.**
3. **Write your *Name*, *PID*, and *Section* on the front of your Blue Book.**
4. **Write your solutions clearly in your Blue Book**
   (a) **Carefully indicate the number and letter of each question and question part.**
   (b) **Present your answers in the same order they appear in the exam.**
   (c) **Start each question on a new side of a page.**
5. **Read each question carefully, and answer each question completely.**
6. **Show all of your work; no credit will be given for unsupported answers.**

1. (6 points) Compute $\sin^{-1}\left(-\frac{5}{4}\right)$ using the principal branch of the logarithm and the branch $\sqrt{r}e^{i\frac{\theta}{2}}$ with $0 < \theta < 2\pi$ of the square root. Use the formula $\sin^{-1}(z) = -i\log\left[iz + \sqrt{1-z^2}\right]$.

2. (6 points) Consider the function $f(z) = \sin(\bar{z})$.
   (a) At what point(s) is $f(z)$ differentiable?
   (b) At what point(s) is $f(z)$ analytic?

3. (6 points) Evaluate $\oint_C \frac{2z}{z^2+1}\,dz$, where C is the circle $|z| = 2$. You may use the fact that $\frac{2z}{z^2+1} = \frac{1}{z-i} + \frac{1}{z+i}$.

4. (6 points) Determine an upper bound for $\left|\oint_C \frac{z^3}{(z^2+4)^2}\,dz\right|$, where C is the circle $|z| = 3$.

5. (6 points) Find the radius of convergence of the power series $\sum_{k=1}^{\infty} \frac{1}{k}\left(\frac{i}{i+1}\right)\frac{z^k}{3^k}$.