# MATH 4200-1 FALL 2008

## Third Mock Exam

INSTRUCTOR: H.-PING HUANG

LAST NAME _____

FIRST NAME _____

ID NO. _____

**INSTRUCTION:** SHOW ALL OF YOUR WORK. MAKE SURE YOUR ANSWERS ARE CLEAR AND LEGIBLE. USE **SPECIFIED** METHOD TO SOLVE THE QUESTION. IT IS NOT NECESSARY TO SIMPLIFY YOUR FINAL ANSWERS.

| | | |
|---|---|---|
| PROBLEM 1 | 25 | _____ |
| PROBLEM 2 | 25 | _____ |
| PROBLEM 3 | 25 | _____ |
| PROBLEM 4 | 25 | _____ |
| TOTAL | 100 | _____ |

# PROBLEM 1

(25 pt) Find the Laurent expansion for $f(z) = \frac{z}{z^2+1}$ in the annulus

$$A = \{z \in \mathbb{C} : 0 < |z - i| < 2\}.$$

# PROBLEM 2

(25 pt) Find

$$\int_0^\infty \frac{1}{(1+x^2)^2} dx.$$

# PROBLEM 3

(25 pt) Find the Fourier transform of

$$f(x) = \frac{1}{x^2 + 4x + 5}.$$

# PROBLEM 4

(25 pt) Prove that

$$\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}.$$