MA 330 001
EXAM 2 REVIEW SHEET
DISTRIBUTED APRIL 10, 2009

Exam 2 will cover chapters 7 – 9 of *Journey Through Genius* and chapters 1 – 4 of *The Calculus Gallery*. The exam will be in-class, with no notes or books allowed. The exam will cover the material described below.

(1) For each of the following theorems/results, be prepared to state the theorem/result, provide an outline of the proof, and/or provide a detailed proof as found in the pages and texts indicated below.
   - Newton's approximation of π (pages 174-176 of JTG)
   - Infinite summation of the reciprocals of the triangular numbers (pages 186-187 of JTG)
   - Formula for geometric series (page 194 of JTG)
   - Divergence of the harmonic series:
     - Johann Bernoulli's proof (page 196-198 of JTG)
     - Jakob Bernoulli's proof (outline only, pages 37-40 of TCG)
     - Nicole Oresme's proof (pages 202-203 of JTG)
     - Pietro Mengoli's proof (pages 204-205 of JTG)
   - Bernoulli's Theorem N (pages 42-43 of TCG)
   - Bernoulli's Theorem T (pages 43-44 of TCG)
   - The lemma and applications of it in the "Spectacular Sums" section of chapter 4 in TCG (pages 60-64)
   - Euler's determination of
   $$\sum_{k=1}^{\infty} \frac{1}{k^2}$$
   (pages 215-217 of JTG)

(2) Be prepared to expand functions involving binomials into power series using Newton's generalized binomial series expansion.

(3) Be prepared to provide biographical information about Newton, Leibniz, Johann and Jakob Bernoulli, and Euler.

(4) Be prepared to discuss your favorite of the "Great Theorems" discussed in chapters 7 – 9 of *Journey Through Genius* and explain in detail why it is your favorite.