MA 330 001
FINAL EXAM REVIEW SHEET
DISTRIBUTED APRIL 24, 2009

The final exam will be in CB 347 from 10:30-12:30 on Tuesday, May 5, with no notes or books allowed. The exam will cover the material described below (*DON'T MISS THE ITEMS ON THE BACK SIDE OF THE SHEET*).

(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, unless indicated otherwise.
   - Quadrature of the Lune, including quadrature of the rectangle and triangle (Great Theorem, pages 13, 14, 18 of JTG)
   - Pythagorean theorem (Great Theorem, page 49 of JTG)
   - Converse of the Pythagorean theorem (page 51 of JTG)
   - Measurability of composite numbers by primes (page 70 of JTG)
   - Infinitude of primes (Great Theorem, page 73 of JTG)
   - Determination of area of regular polygon (page 90 of JTG)
   - Proposition 1 of *Measurement of a Circle* (Great Theorem, page 92 of JTG)
   - Heron's Formula (Great Theorem, page 122 of JTG, OUTLINE ONLY)
   - Derivation of Pythagorean theorem from Heron's formula (page 127)
   - Cardano's solution of the depressed cubic (Great Theorem, page 143)
   - Newton's approximation of π (Great Theorem, pages 174-176 of JTG)
   - Divergence of the harmonic series:
     - Johann Bernoulli's proof (Great Theorem, page 196-198 of JTG)
     - Jakob Bernoulli's proof (pages 37-40 of TCG, OUTLINE ONLY)
     - 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)
   - Determination of
   $$\sum_{k=1}^{\infty} \frac{1}{k^2}$$
   (pages 215-217 of JTG)
   - Fermat's little theorem (pages 226-228 of JTG, OUTLINE ONLY)
   - Euler's refutation of Fermat's conjecture (Great Theorem, pages 229-234 of JTG)
   - The non-denumerability of the continuum (Great Theorem, pages 259-261 of JTG)

(2) Be prepared to sketch a map and label it with any of the geographic areas discussed so far in *Journey Through Genius*.

(3) Be prepared to construct a timeline indicating when all of the theorems listed above were proved.

(4) Be prepared to expand functions involving binomials into power series using Newton's generalized binomial series expansion; be prepared to express the first few terms of your answer and to write your answer in modern "sigma" summation notation.
(5) Be prepared to provide biographical information about Euclid, Archimedes, Cardano, Newton, Leibniz, Johann and Jakob Bernoulli, Euler, Gauss, and Cantor.
(6) Be prepared to discuss your favorite of the "Great Theorems" discussed in *Journey Through Genius* and explain in detail why it is your favorite.