MAT 346 Review II

I. Mathematics Topics
   a. Algebra
      i. Descartes' Factor Theorem
      ii. Fundamental Theorem of Algebra
   b. Numbers
      i. Primes, Fermat primes
      ii. Formulae for π
      iii. Factorials
      iv. Combinatorial (Pascal)
      v. Riemann zeta function
         1. Connection to primes
         2. General properties
      vi. Euler's Constant
      vii. AGM (Arithmetic-Geometric Mean)
      viii. Germain Prime
      ix. Fermat's Little Theorem
      x. Euler's ϕ-function
   c. Projective Geometry
      i. Pappus' Theorem
      ii. Perspective
      iii. Vanishing points
      iv. Horizon
      v. Cross-ratio
      vi. Homogeneous coordinates
      vii. Point(s) at infinity
      viii. Projective Lines
      ix. Projective sphere
      x. How do lines, circles, conics project?
   d. Non-Euclidean Geometry
      i. Parallel postulate
      ii. Three types of geometry
      iii. Curvature and types
      iv. Sum of angles
      v. Sphere
      vi. Pseudosphere
      vii. Hyperbolic plane
      viii. Beltrami-Poincare model
      ix. Beltrami-Klein model
      x. Poincare disk
      xi. Geodesics
      xii. Hyperboloids
      xiii. Reimannian geometry
      xiv. Hyperbolic geometry
   e. Equations
      i. Cubic
      ii. Biquadratic
      iii. Quintic
   f. Infinite Series
      i. Geometric
      ii. Logarithm
      iii. Exponential
      iv. Sine, Cosine
      v. Binomial
      vi. Harmonic
      vii. Power series
      viii. Telescoping
      ix. Inversion of series
      x. Basel Problem
      xi. Euler's Trick
   g. Calculus
      i. Tangents
      ii. Infinitesimals
      iii. Indivisibles
      iv. Method of Exhaustion
      v. How did Wallis integrate powers?
      vi. Arclength
      vii. Rectification
      viii. Fundamental Theorem of Calculus
   h. Curves
      i. Conics
      ii. Archimedean spiral
      iii. Conchoid, cissoids
      iv. Cycloid
      v. Ellipse
      vi. Lemniscate
   i. Elliptic Functions
   j. Complex Numbers
      i. Argand diagram
      ii. Euler's Formula
      iii. De Moivre's Formula
      iv. Roots of unity
      v. Stereographic Projection
      vi. Conformal map
      vii. Riemann surfaces
      viii. Relation to torus
   k. Tiling
      i. Polygons
      ii. Circle Limits
      iii. Schlafli symbol
      iv. Nonperiodic

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        v. Penrose tiling – kites, darts, thin and thick rhoms

        vi. Einstein tiles – hat, spectre

        vii. Polyominoes

        viii. pentominoes

    l. Group Theory

        i. Properties of groups

        ii. Permutation group

        iii. Permutations

II. Hardy, Littlewood, Ramanujan

    a. Taxicab numbers

    b. 1729

III. People

    a. Eudoxus

    b. Archimedes

    c. Pappus of Alexandria

    d. Proclus

    e. Saccheri

    f. Madhava

    g. Brunelleschi

    h. Cardano

    i. Bombelli

    j. Harriot

    k. Desargues

    l. Descartes

    m. Mersenne

    n. Cavalieri

    o. Fermat

    p. Argand

    q. Wessel

    r. Roberval

    s. Torricelli

    t. Wallis

    u. Barrow

    v. Gregory

    w. Taylor

    x. Cotes

    y. Mercator

    z. Newton

    aa. Leibniz

    bb. Bernoulli (Johann, Jacob, Daniel, Nicholas, …)

    cc. Euler

    dd. Laplace

    ee. d'Alembert

    ff. de Moivre

    gg. Gauss

    hh. Cauchy

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    ii. Galois

    jj. Vandermonde

    kk. Oresme

    ll. Abel

    mm. Jacobi

    nn. Fagnano

    oo. Mobius

    pp. Legendre

    qq. Laguerre

    rr. Bolyai

    ss. Lobachevsky

    tt. Beltrami

    uu. Klein

    vv. Poincare

    ww. Poisson

    xx. Liouville

    yy. Fourier

    zz. Riemann

    aaa. Weierstrass

    bbb. Germain

    ccc. Somerville

    ddd. Lovelace

    eee. Nightingale

    fff. Kovalevskaya

    ggg. Bassi

    hhh. Babbage

    iii. Penrose

    jjj. Escher

    kkk. Durer

IV. Books

    a. Principia (Philosophiae Naturalis Principia Mathematica)

    b. Arithmatica Infinitorium

    c. Disquisitiones Arithmeticae

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