
Sample Final Exam - Math 136 -Spring 2008

This list is only suggestive of the type (and length) of problems appearing on the Final Exam.

Solving all the problems on this sample final and turning them in *before class* on Friday, May 9 at classtime will count as HMW 12.

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- **Problem 1**

Evaluate the integrals:

$$(a) \int \arctan 4t \, dt, \quad (b) \int_0^1 y^2 \sqrt{1+y^3} \, dy.$$

- **Problem 2**

Evaluate the integrals

$$(a) \int (1 + \cos \theta)^2 \, d\theta, \quad (b) \int \frac{\sqrt{1+x^2}}{x} \, dx.$$

- **Problem 3**

Evaluate the improper integral or show it is divergent

$$(a) \int_1^{\infty} \frac{1}{(2x+1)^3} \, dx, \quad (b) \int_0^4 \frac{\ln x}{\sqrt{x}} \, dx$$

- **Problem 4**

Find the volume of the solid obtained by rotating the region in the (x, y) -plane, bounded by the curves $y = x^2 + 1$, $y = 9 - x^2$ about the line $y = -1$.

- **Problem 5**

Find the length of the curve

$$y = e^x, \quad 0 \leq x \leq 1$$

- **Problem 6**

Find the centroid of the region bounded by the curves

$$y = x + 2, \quad y = x^2$$

- **Problem 7**

(a) Show that the sequence $\{a_n\}$, where $a_n = \frac{n+1}{2n^2-3}$ is a decreasing sequence

(b) Determine whether the series

$$\sum_{n=1}^{\infty} (-1)^n \frac{n+1}{2n^2-3}$$

is absolutely convergent, conditionally convergent or divergent.

• **Problem 8**

Find the radius of convergence and interval of convergence of the series

$$\sum_{n=1}^{\infty} \frac{(x-3)^n}{n^2 2^n}$$

• **Problem 9**

(a) Find a power series representation for $f(x) = \ln(1+x^2)$ and determine its radius of convergence.

(b) Express the indefinite integral below as a power series.

$$\int \frac{\ln(1+x^2)}{x} dx$$

• **Problem 10**

Find the area of the region enclosed by the parametric curve $x = t - \frac{1}{t}$ and $y = t + \frac{1}{t}$ and the line $y = 1$.

• **Problem 11**

Find the length of the polar curve

$$r = \theta^2, \quad 0 \leq \theta \leq 2\pi$$

• **Problem 12**

Identify the curves, by finding the Cartesian equation for the polar curves

$$(a) r = 2 \sin \theta + 2 \cos \theta, \quad (b) r = \frac{1}{1 + 2 \cos \theta}$$

Review Topics for the Final Exam

MATH 136-001, SPRING 2008

- Techniques of Integration
 - Substitution and Integration by Parts
 - Trigonometric Integrals and Substitutions
 - Partial Fractions
 - Improper Integrals. Convergence. Comparison Tests.
- Application of Integration
 - Areas between Curves
 - Volumes of Solids of Revolution. Methods of Washers and Cylindrical Shells
 - Arc Length
 - Center of Mass and Centroids of Planar Regions

- Sequences and Series:
 - Convergence and divergence for sequences $\{a_n\}$ and series $\sum a_n$.
 - Geometric series, harmonic series
 - Series with positive terms (Integral test, comparison test, limit comparison)
 - Alternating series test, Absolute convergence test, Ratio test and root test
 - Radius of convergence and interval of convergence for power series
 - Representation of functions as power series
 - Maclaurin and Taylor series

- Parametric Equations and Polar Coordinates
 - Parametric Curves. Lengths. Areas Enclosed by Parametric Curves.
 - Polar Curves. Areas and Lengths in Polar Coordinates.

Any of the topics listed above can appear of the final exam. For a comprehensive review, please revisit the previous exams, the problems assigned in homework and other similar problems at the end of each section AND the review section at the end of Chapters 5-9.