

Math 20B
Final Examination
March 23, 2012
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Version A

Instructions

1. No calculators or other electronic devices are allowed during this exam.
2. You may use one page of notes, but no books or other assistance during this exam.
3. Write your *Name*, *PID*, and *Section* on the front of your Blue Book.
4. Write the *Version* of your exam on the front of your Blue Book.
5. Write your solutions clearly in your Blue Book
 - (a) Carefully indicate the number and letter of each question and question part.
 - (b) Present your answers in the same order they appear in the exam.
 - (c) Start each question on a new side of a page.
6. Read each question carefully, and answer each question completely.
7. Show all of your work; no credit will be given for unsupported answers.

0. (1 point) Carefully read and complete the instructions at the top of this exam sheet.

1. (6 points) Compute the volume of the solid whose base in the xy -plane is bounded by the semicircle $y = \sqrt{16 - x^2}$ and the x -axis, and whose cross-sections perpendicular to the x -axis are squares.

2. (6 points) Compute the derivative $\frac{d}{dx} \int_0^{2\ln(x)} \cos(t^2) dt$.

3. (6 points) When a hot object is placed in a water bath whose temperature is $25^\circ C$, it cools from $100^\circ C$ to $50^\circ C$ in 150 seconds. In another bath, the same cooling occurs in 120 seconds. Find the temperature of the second bath.

4. (6 points) Use the limit comparison test to determine whether the series $\sum_{n=2}^{\infty} \frac{1}{n^2 - \sqrt{n}}$ converges or diverges.

5. (6 points) Write the complex number $(1 + i)^{21}$ in the form $a + bi$. You need not simplify numbers like $2^{\frac{15}{2}}$. (Suggestion: you may wish to first put $1 + i$ into polar form.)

6. (6 points) Compute the following indefinite integrals.

(a) $\int \sin(x^2) \cos(x^2) x dx$

(b) $\int x^3 \ln(x) dx$

7. (6 points) Evaluate $\int e^{2ix} \sin(5x) dx$. Leave the result in complex exponential form.

8. (a) (5 points) Find the partial fraction expansion of $\frac{10x^2 + 2x - 6}{x^3 - x}$.

(b) (3 points) Evaluate $\int \frac{10x^2 + 2x - 6}{x^3 - x} dx$.

9. (6 points) Find the first four terms of the Taylor series for $f(x) = \ln(2x)$ centered at $x = 1$, and determine its radius of convergence.