

Math 1B Midterm 1

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July 7, 2008

Work through the following practice midterm as a group. As always with practice tests, the inclusion or absence of certain types of problems should not be taken as an indication of what will or will not be on the actual midterm. And don't freak out: this is longer than the actual midterm will be.

1. Determine whether each improper integral is convergent or divergent. Evaluate the convergent ones:

(a) $\int_1^{\infty} \frac{\ln x}{x^2} dx$

(b) $\int_0^1 \frac{1}{4y-1} dy$

(c) $\int_0^{\infty} xe^{-x} dx$

(d) $\int_0^1 \frac{e^x}{x^2} dx$

2. How many subintervals (ie, how big an n) do you need to ensure that approximating $\int_1^2 \sin(x^2) dx$ using Simpson's Rule will give an error of less than 10^{-3} ? Simplify as much as possible, but you don't need to come up with an actual number.

3. Find each of the following integrals:

(a) $\int \sin^3 x \cos^3 x dx$

(b) $\int \sin \sqrt{x} dx$

(c) $\int \frac{4x^2 - 3x + 5}{(x-1)^2(x^2+x+1)} dx$

(d) $\int \frac{1}{4\sqrt[3]{x^2} - 4\sqrt[3]{x} - 3} dx$

(e) $\int \frac{dx}{x\sqrt{9-x^2}}$

(f) $\int (\sin^{-1} x)^2 dx$ Note: $\frac{d}{dx} \sin^{-1} x = \frac{1}{\sqrt{1-x^2}}$

(g) $\int \cos^4 x - \sin^4 x dx$

4. Find the length of the curve $y = \ln x$ between $x = 1$ and $x = \sqrt{3}$