

# Midterm Exam II

Math 10B  
10/15/08

Name: \_\_\_\_\_  
Section: \_\_\_\_\_

**Read all of the following information before starting the exam:**

- READ EACH OF THE PROBLEMS OF THE EXAM CAREFULLY!
- Show all work, clearly and in order, if you want to get full credit. I reserve the right to take off points if I cannot see how you arrived at your answer (even if your final answer is correct).
- Give your answers in exact form, for instance:

$$\frac{1}{2}(e^\pi + e^{2\pi}).$$

as opposed to 279.31617.

- A single  $8\frac{1}{2} \times 11$  sheet of notes (double sided) is allowed. Calculators are permitted.
- Circle or otherwise indicate your final answers.
- Please keep your written answers clear, concise and to the point.
- This test has 5 problems and is worth 100 points. It is your responsibility to make sure that you have all of the pages!
- Turn off cellphones, etc.
- Good luck!

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| <b>1</b> |  |
| <b>2</b> |  |
| <b>3</b> |  |
| <b>4</b> |  |
| <b>5</b> |  |
| $\Sigma$ |  |

**1.** (20 points) Find the following definite or indefinite integrals.

**Show all steps:** That is, don't just appeal to a formula.

**a.** (10 pts)

$$\int_0^1 \arcsin(x) dx.$$

Hint:  $\frac{d}{dx} \arcsin(x) = \frac{1}{\sqrt{1-x^2}}$

**b.** (10 pts)

$$\int \frac{dx}{x^2 + 4x + 5}.$$

**2.** (20 points)

**a.** (10 pts) Find the partial fractions decomposition of

$$\frac{x^4 - x^3 + 4x^2 - 3x + 4}{x^3 + 4x - x^2 - 4}.$$

Note: you need not integrate.

Hint:  $x^3 + 4x - x^2 - 4 = (x - 1)(x^2 + 4)$ .

**b.** (10 pts) Find

$$\int \frac{x - 2}{x^2 + 1} dx.$$

**3.** (20 points)

**a.** (10 pts) Determine whether

$$\int_0^5 \frac{1}{(5-x)^{2/3}} dx$$

converges or diverges. If it converges, find its value.

**b.** (10 pts) Use a comparison test to determine whether

$$\int_1^{\infty} x^{\sin(x)-3} dx$$

converges or diverges.

**4.** (20 points)

**a.** (10 pts) Find the volume obtained when rotating the region bounded by the  $y$ -axis, the line  $y = e$  and the function  $f(x) = e^x$  about the  $x$ -axis.

**b.** (10 pts) A building is built whose base is the region bounded by the  $x$ -axis, the  $y$ -axis and the line  $y = 1 - x$ , and whose cross-sections perpendicular to the  $x$ -axis are semi-circles. Determine the volume of the building.

**5.** (20 points)

**a.** (10 pts) You want to invest 50,000 dollars at some interest rate  $r$  compounded continuously, so that the amount you have in 10 years is 100,000 dollars. What rate must you invest at?

**b.** (10 pts) Hand Over Fist Industries (Motto: We Own You) profit stream is given by

$$P(t) = e^{0.05t},$$

Their profit is invested at a 6% interest rate. What is the present value of their earnings over the next 2 years ( $t = 0$  represents the present.)