MA 126 - 8C CALCULUS II

February 23, 2017

Name (Print last name first): .....

Student Signature: .....

TEST II

Closed book - Calculators and One Index Card are allowed!

PART I

Part I consists of 5 questions. Clearly write your answer (only) in the space provided after each question.
Show your work to justify your answers. Very limited partial credit or none at all for this part of the test!

Each question is worth 8 points.

Question 1

Determine whether the improper integral $\int_4^\infty \frac{1}{\sqrt{x-3}}\,dx$ is convergent or divergent. Find its numerical value if it converges!

Answer: .....

Question 2

Sketch the region enclosed by the curves $y = x^2$ and $y = 2 - x^2$, and then find its area.

Answer: .....

Question 3

Find the volume of the solid obtained by rotating about the y-axis the region bounded by the lines $y = x$, $x = 0$ and $y = 1$.

Answer: .....

Question 4

Sketch the region and use the method of cylindrical shells to write out an integral-formula for the volume of the solid generated by rotating about the y-axis the region bounded by the curve $y = 2 + x - x^2$ and the line $y + x = 2$. (Do NOT compute the integral you obtain!)

Answer: .....

Question 5

When a particle is located a distance x meters from the origin, a force $f(x) = \sin(\pi x/2)$ newtons acts on it. How much work is done in moving the particle from $x = 0$ m to $x = 2$ m? (Express your answer in Nm; i.e., in J.)

Answer: .....

PART II

Each problem is worth 15 points.

Part II consists of 4 problems. You must show your work on this part of the test to get full credit. Displaying only the final answer (even if correct) without the relevant steps will not get full credit - no credit for unsubstantiated answers!

Problem 1

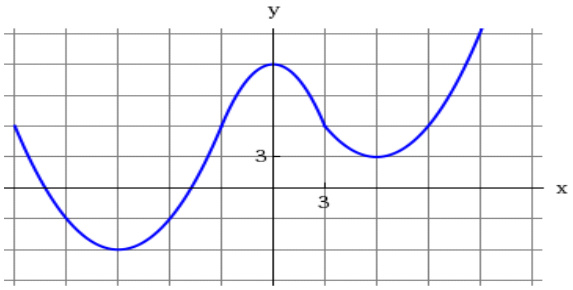
Make a substitution first and then use a technique of integration to evaluate the improper integral

$$\int_0^\infty e^{-\sqrt{x}}\,dx.$$

(State the name of the technique of integration you use, and show your work for full credit!)

Problem 2

Use the graph of the function $y = f(x)$ shown below to set up and write out explicitly the mid-point rule approximation M_4 of the integral $\int_{-12}^{12} f(x)\,dx$ with 4 sub-rectangles. (Do NOT add up the terms!)



(• Notice the scaling in the picture!)

Problem 3

Find the volume of the solid obtained by rotating the region bounded by the curves $y = x^2$ and $y = \sqrt{x}$ about the line $y = 1$.

Problem 4

Find the work done in pumping all the water out of a cubic container with edge 6 m which is 1/2 full. The water has to be lifted all the way to the top of the cubic tank in order to be removed. (You may use the approximation $g \approx 10\ m/s^2$ and the water density $\rho = 1,000\ kg/m^3$.)

SCRATCH PAPER

(Scratch paper will not be graded!)

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