Mathematics 134 – Calculus 2 With Fundamentals
Exam 2 – Review Sheet
March 2, 2018

General Information

As announced in the course syllabus, the second midterm exam of the semester will be given Friday, March 16 (the first Friday after we return from Spring Break). The format will be similar to that of the first midterm.

- You will be permitted to use a calculator.
- Use of cell phones, I-pods, I-pads, tablets, and any other electronic device besides a calculator *is not allowed* during the exam. Please leave such devices in your room or put them away in your backpack (and make sure cell phones are turned off).

What will be covered

The exam will cover the material since the last exam (Problem Sets 3, 4), namely the following material from sections 6.1, 6.2, 6.3, 7.1 of Rogawski/Adams:

1. Area between curves
2. Applications of integration and setting up integral formulas: volumes of solids with known cross-sections
3. Volumes of solids of revolution (disk and washer cross-sections, cylindrical shells as an alternative method)
4. Integration by parts

Important Note: Many of the problems on this exam will require you to set up and compute an integral to find the quantity that is asked for. In addition to knowing how to set up the required integral, the methods of integration tested on the first exam (i.e. basic rules, u-substitution) and the new methods on this exam (integration by parts) might be required to evaluate the integral. In other words, this exam is *in effect a cumulative exam on the material since the start of the semester*. Especially if there were things you had not mastered on the first exam, you will probably want to begin your review for this exam by going back and looking at the material from sections Chapter 5 in Rogawski/Adams.

There will be a review for the exam in class on Thursday, March 15 and Tori will be doing her regular Thursday session that evening for last-minute questions.

Review Problems

Chapter 6 review problems: 1, 3, 5, 7, 9, 27, 29, 31, 33.

Chapter 7 review problems: 3, 11, 13, 27, 31, 53, 57

Sample Exam Questions

Disclaimer: The actual exam questions may be organized differently and ask questions in different ways. This list is also quite a bit longer than the actual exam will be (to give you some idea of the range of different questions that might be asked).

I. Compute each of the integrals below using some combination of basic rules, u-substitution, integration by parts. You must show all work for full credit.

A)

$$\int \frac{e^{\tan^{-1}(x)}}{1+x^2}\,dx$$

B)

$$\int x^2 \sin(2x)\,dx$$

C)

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

D)

$$\int_0^{1/2} \sin^{-1}(x)\,dx$$

E) Use integration by parts to show this reduction formula: If n is a positive integer, then

$$\int x^n e^{ax}\,dx = \frac{x^n e^{ax}}{a} - \frac{n}{a}\int x^{n-1}e^{ax}\,dx$$

F) Apply the result from part (E) (repeatedly) to compute $\int x^4 e^{-2x}\,dx$.

G)

$$\int x^8 \ln(x)\,dx$$

II.

(A) Let R be the region in the plane bounded by $y = 3 - x^2$ and the x-axis.

(1) Sketch the region R.

(2) Find the area of R.

(3) Find the volume of the solid generated by rotating R about the x-axis.

(4) Find the volume of the solid generated by rotating R about the line $y = 5$.

(5) Find the volume of the solid generated by rotating R about the line $y = -2$.

(6) Find the volume of the solid generated by rotating R about the line $x = -4$. (Note: This can be done "by slices" or by "shells." Try it both ways and check that you get the same result.

(B) Let R be the region in the plane bounded by $y = 3x$ and $y = x^2$.

(1) Sketch the region R.

(2) Find the area of R.

(3) Find the volume of the solid generated by rotating R about the x-axis.

(4) Find the volume of the solid generated by rotating R about the y-axis.

(C) Let R be the region in the plane bounded by $y = \cos(\pi x)$, $y = 1/2$, $x = -1/3$ and $x = 1/3$.

(1) Sketch the region R.

(2) Find the area of R.

(3) Find the volume of the solid generated by rotating R about the x-axis.

(4) Find the volume of the solid generated by rotating R about the line $y = -1$.

III. ("Thought question") The height of a monument is 20m. The horizontal cross-section of the monument at x meters from the top is an isosceles right triangle with legs $x/4$ meters. Is the given information enough to find the volume of the monument? (Hint: Look up *Cavalieri's Principle.*)