**Review for Test 1**

**Math 152: Calculus II**

**Format**

* The exam will contain 10 problems (plus or minus 3) and will last 50 minutes.
* It is a paper and pencil exam.
* You will need to show your work.
* You may use a graphing calculator. However, you may not use a CAS calculator. Please remove any saved formulas from your calculators as I may check for these and delete them.

**Basic Content.**

* You are responsible for sections 5.1-5, 7.7, 6.1-2.
* In addition to the material covered in the class, you are responsible for all of the basic facts you have learned since kindergarten. These include the facts that George Washington was the President of the United States of America, , and that .

**In Studying . . .**

* You should be comfortable with all the quiz questions you have seen.
* You should be able to solve every example done in class.
* You should be able to solve every homework question
* You must be able to answer warm up questions and paraphrase quotes such as the quote by the Scottish mathematician George Crystal who wrote, *“Every mathematical book that is worth reading must be read ‘backwards and forwards,’ if I may use the expression. I would modify Lagrange's advice a little and say, ‘Go on, but often return to strengthen your faith.’ When you come to a hard or dreary passage, pass it over; and come back to it after you have seen its importance or found the need for it further on.”*

**Ideas that may help with test prep …**

* Review the most recent material first.
* Summarize your notes. Make note cards for important formulas and definitions. Set them aside once the definitions are known.
* Rework quiz questions, examples from class, and homework questions (in this order).
* Practice like you will play – know the material without your notes.
* Study with a friend to have more fun.
* Look to online resources such as YouTube and the Khan Academy to fill in holes.
* Show up at least five minutes early for the exam.

**A Summary of the Topics**

**Section 5.1: Areas and Distance**

* notation.
* Approximating areas using rectangles.
	+ Right end-points
	+ Left end-points.
	+ Midpoints.
* Finding the exact area using an infinite number of rectangles.
* The relationship between the area under the curve and the distance problem.

# Section 5.2: The Definite Integral

* The Definition of a Definite Integral (The Riemann Sum).
* Positive and negative “area” under a curve (algebraic and geometric area).
* The properties of summations and integrals.
* Set up Riemann Sums given a definite integral. This includes finding , , and .
* The comparison properties of integrals.
* Memorize the sum formulas for , , and (good stuff). I will provide these for 1 point each upon request in the exam.

# Section 5.3: The Fundamental Theorem of Calculus

* The FToC part 2.
* Using FToC to find derivatives of functions defined by a definite integral. See problem #3.
* Using the FToC to evaluate definite integrals.

# Section 5.4: Indefinite Integrals and the Total Change Theorem

* Indefinite integrals.
	+ Don’t forget “+ C”
* Definite integrals.
* The total (net) change theorem.
	+ Use it … don’t memorize it.

# Section 5.5: The Substitution Rule

* The substitution rule for indefinite and definite integrals.
	+ Remember to change your limits of integration.
	+ The equals “=” symbol is powerful and easy to misuse during integration.
* Integrals of symmetric functions
	+ Even functions …
	+ Odd functions …

# Section 6.1: Areas Between Curves

* Find the area between curves in terms of *x* and *y*.
	+ If integrating WRT *x*, then your integrand = “top – bottom” and your bounds are *x* values.
	+ If integrating WRT *y*, then your integrand = “right – left” and your bounds are *y* values.

**Section 6.2: Volumes**

* **Set-up** integrals to find volumes of rotation using disks and washers.
* Understand how to find disks and washers regardless of the axis of rotation.
* **Set –up** volumes to find volumes of “ugly” critters – usually using “disks.”
* Note: You will have the use of a non-symbolic graphing calculator – although you should be able to do any graphing without a calculator.
* Note: You will need to set-up integrals, however I will not ask you to find the volume.

**Section 7.7: Numerical Integration**

* Understand the various methods described in the section including:
	+ The Trapezoidal Rule
	+ The Midpoint Rule
	+ Simpson’s Rule
* Be able to approximate an integral using any of the given methods up to n=8.
	+ Calculators are okay, but you will need to provide a little explanation for how your calculator was used.
* Since quizzed on it, I will not ask a question about error bounds.

**General note**:

* You should be able to explain and/or demonstrate an understanding of our basic process for setting up applications: (0) draw a picture, (1) subdivide the interval, (2) choose sample points, (3) find an expression for the differential element, (4) find the exact value using the limit of the Riemann sums, and (5) find the exact value using a definite integral.

**Practice Problems:**

 Estimate  using . Give an exact answer (not a decimal approximation).

 Use the definition of the definite integral to calculate .

 Find the following: 

 Evaluate the indefinite integral.

 A car speeds up at a constant rate from 10 to 70 mph over a period of half an hour. Its fuel efficiency (in miles per gallon) at various speeds is shown in the table. Make left, right, and midpoint estimates of the quantity of fuel used during the half hour. Round to four decimal places.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Speed (mph) | 10 | 20 | 30 | 40 | 50 | 60 | 70 |
| Fuel efficiency (mpg) | 15 | 18 | 21 | 23 | 24 | 25 | 26 |

 Evaluate the definite integral , if it exists.

 Let  on  for the function  portrayed in the given graph. Given what you know, sketch a graph of  on the interval.

|  |  |
| --- | --- |
|  |  |





 Find the volume of the solid obtained by rotating the region bounded by  and  about the line . (On the exam, I would not ask you to evaluate the integral, merely set it up).

 Find the volume of the solid formed in the following manner. The elliptical region with boundary curve  is intersected with circular cross-sections perpendicular to the ellipse. The diameter of each circular cross-section is in the plane of the ellipse. Hint: This region looks like the ball used in a major professional sport. (On the exam, I would not ask you to evaluate the integral, merely set it up).

 Find the volume of the solid obtained by rotating the region bounded by  and  (when ) on  about the *x*-axis. (On the exam, I would not ask you to evaluate the integral, merely set it up).

Evaluate the integral in terms of *a*. Verify the volume is .