

You should also be able to do WebAssign 10! It is not due until after the exam, but some problems from the assignment show up here. I would work on 10 *before* Wednesday!

This is a review examination. The actual exam will not be as long. It is intended to help you review important concepts and give you an idea of *what kind* of questions may be asked (but *not* the questions themselves!).

Instructions: Show all work for full credit. Refer to any work done on separate pages.

1. Definitions and Concepts.

- Give a function, f , which satisfies the relationship $\frac{df}{dx} = 1$.
- Why does it not matter if I forget the “+C” when using *definite* integration?
- Find the error in my proof that $0 = 1$.

Let $f(x) = 2x$ and $g(x) = 2x + 1$. Then $f'(x) = 2$ and $g'(x) = 2$. Anti-differentiating, $f(x) = 2x + C$ and $g(x) = 2x + C$. Then $f(x) = g(x)$. So it follows $2x = 2x + 1$. Subtracting $2x$ from both sides of the equation, I find $0 = 1$.

- What does it mean for an improper integral to converge? Diverge?
- Give an example of a function, $f(x)$ such that the area bounded by the x -axis, $f(x)$, $x = 0$, and $x = 1$ can be determined exactly using one rectangle (as opposed to an infinite series of rectangles).
- Give an example of a function, $f(x)$, such that $\int f(x) = 3x^2 + 2x$.

2. Find $\int f(x)dx$ for each of the following.

- $f(x) = 3x^2 + 5x + 1$
- $f(x) = \frac{44}{x}$
- $f(x) = \frac{1}{x}(\ln(3x))^5$
- $f(x) = \frac{9x^2+3}{3x^3+3x}$
- $f(x) = \sqrt{x}$

3. Find $\int_0^2 f(x)dx$ for each of the following.

- $f(x) = x^2 + x$
- $f(x) = xe^{x^2}$

4. Find the area of the region bounded by the x -axis and the curve $f(x) = -(x^2) + 4$.

5. Find the volume of the solid constructed by rotating the above region about the x -axis.

6. Find the area of the region bounded by the curves $f(x) = \sqrt{x}$ and $f(x) = x^2$.

7. Consider the following supply function, $S(x)$, and demand function, $D(x)$, where price is a function of quantity.

$$S(x) = x^2 - 2x + 2, D(x) = -2x + 11$$

- a. Find the equilibrium point.
 - b. Find the consumer's surplus at this point.
 - c. Find the producer's surplus at this point.
8. Find the area under the piece-wise defined function from $x = 0$ to $x = 99$.

$$f(x) = \begin{cases} 1 & \text{if } x \leq 50; \\ 2 & \text{if } x > 50. \end{cases}$$

9. Find the amount of continuous money flow in which 5000 per year is being invested at 6%, compounded continuously, for 45 years.
10. In 1897 the world's consumption of Watsonium-199 was 55,000 ft^3 . The amount used has steadily increased at an average rate of 10% per year. What is the consumption rate in 2007? What was the total amount of Watsonium-199 consumed?
11. Find $\int_1^{\infty} f(x) dx$ for each of the following.
- a. $f(x) = \frac{1}{x}$
 - b. $f(x) = \frac{1}{x^2}$
 - c. $f(x) = e^{-x}$
12. Find $\lim_{n \rightarrow \infty} \sum_{i=1}^n f(x_i) \Delta x_i$ where $f(x) = 2x$ on the closed interval $[3, 5]$.