Math 203: Exam #2 Practice

1 Test Format.

The exam will be 50 minutes. You can have two sides of an 8.5x11in paper, same as last exam. You will be asked to show all your work. If you do not show any work, then you will not receive any points. You will be awarded partial credit for partially correct answers.

I suggest reviewing homework problems, classwork problems, and lecture examples as well. I'll post solutions to these practice problems before the test. You should attempt to solve all of these problems, lookup solutions to problems you do not understand, and ask questions if you need to.

2 Problems

The exam will consist of problems asking you about the following:

1. Exponential and logarithm properties
2. Derivatives of exponential/logarithmic functions
3. Logarithmic differentiation
4. Antiderivatives
5. Definite integrals
6. Total area under a curve
7. Area between two curves
8. Applications of integrals
   (a) Marginal cost/revenue/profit
   (b) Net change
   (c) Average value of a function
   (d) Consumer surplus
   (e) Future account value

3 Practice Problems.

These problems are intended to help you prepare for the test. Test problems will be similar to, but not the same as, the problems below. *This list of problems is not all inclusive; it does not represent every possible type of problem. You should take responsibility for your prep and use this review sheet to guide to help you study on your own.*

1. Suppose a particular high-yield investment account provides an annual return of 8% on an initial investment of \$2000. Compounded continuously, the amount in the account after t years is $A(t) = Pe^{rt}$.
   (a) After 5 years, what is the value of the account?
   (b) How long will it take for an investment to increase to 3000?
   (c) Determine the initial investment P needed to reach an account value of \$10,000 in 10 years.
2. Calculate the derivative of each function. Show your work.
   (a) $f(x) = 3e^{2x}$
   (b) $g(x) = e^{-x^2}$
   (c) $G(x) = 2xe^{2x}$
   (d) $h(t) = \dfrac{t}{\ln t}$
   (e) $j(u) = 15(1 - e^u)$

(f) $J(s) = 15(1 - e^{s^2-2s+1})$

(g) $h(t) = \dfrac{\ln t}{t}$

(h) $R(x) = \ln(x^2 + 10)$

(i) $j(x) = \ln(\ln x)$

(j) $g(x) = e^{x^2} e^x$

3. Use logarithmic differentiation to find the derivative of

   (a) $y = \dfrac{x^{2/3}(x-3)^{4/3}}{(2x+5)^{5/3}}$

   (b) $y = \dfrac{x^{3/4}\sqrt{x^2+1}}{(3x+2)^5}$

   (c) $y = \dfrac{(x^3-1)(x+2)^{1/2}}{x+1}$

4. Evaluate the given integral.

   (a) $\displaystyle\int 3x^2 + 3x + 9 + \frac{1}{x^3}\, dx.$

   (b) $\int x^2 - 3x + 2\, dx$

   (c) $\int e^{5x} + 5x^2\, dx$

   (d) $\displaystyle\int_1^4 \frac{1}{\sqrt{x}}\, dx$

   (e) $\displaystyle\int_0^2 e^{-x}\, dx$

   (f) $\int_1^3 x^2 - 3x + 2\, dx$

   (g) $\int_1^{10} \sqrt[3]{x} + \frac{1}{\sqrt[4]{x}}\, dx$

   (h) $\int_{-2}^2 e^{5x} + 5x^2\, dx$

5. Find the area between the following curves:

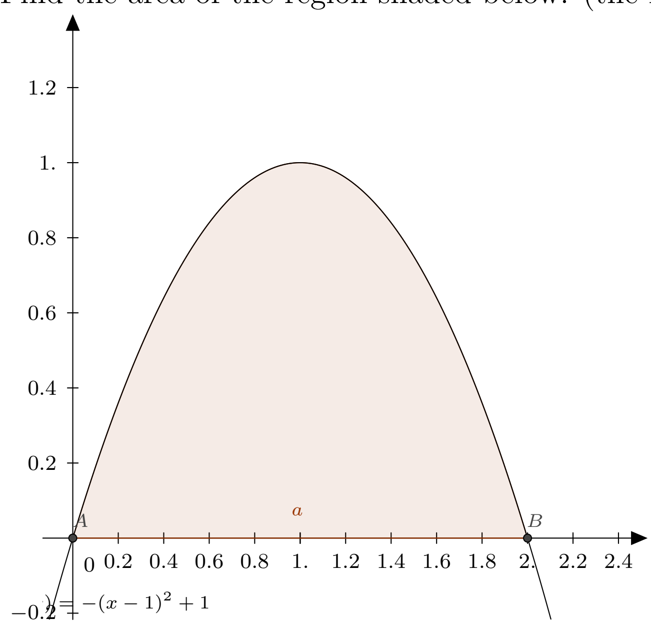
   (a) $y = x^2$ and $y = 2x - x^2$ from $x = 0$ to $x = 1$

   (b) $y = x^2$ and $y = 2x$ from $x = 0$ to $x = 4$

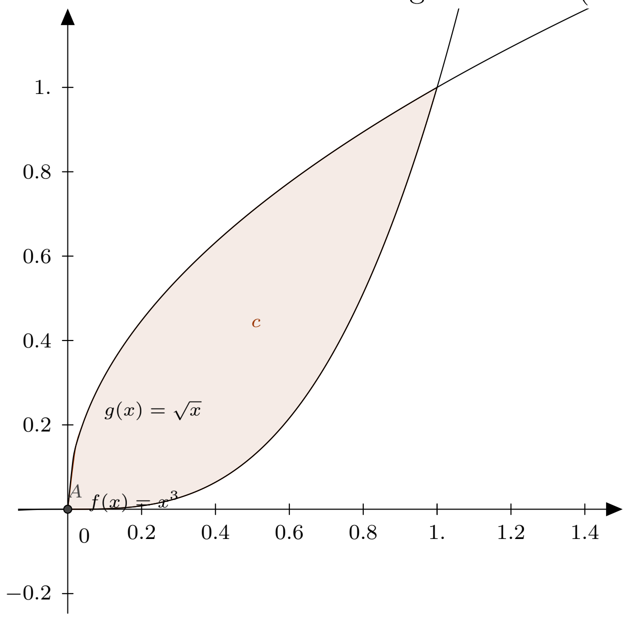
   (c) (Set up but do not evaluate) $y = \dfrac{1}{x+1}$ and $\dfrac{x-1}{3}$ from $x = 0$ to $x = 3$.

   (d) (Set up but do not evaluate) $y = 4 - x^2$ and $y = 0$ from $x = 0$ to $x = 3$

6. Find the area of the region shaded below. (the function is $f(x) = -(x-1)^2 + 1$).



7. Find the area of the shaded region below. (the two functions are $g(x) = \sqrt{x}$ and $f(x) = x^3$).



8. Suppose you sell tickets to a show, and you can sell x tickets for a price of $p(x) = 20 - \frac{1}{10}x$ each.

   (a) Set up *but do not evaluate* a definite integral to calculate the consumer's surplus when $x = 50$.

   (b) Now evaluate your integral from part (a).

9. Suppose the marginal profit for a company is given by the function $M_{profit}(x) = \sqrt{x} - 100$ where x is number of units produced. Find the net change in profit from increasing production from $x = 25$ to $x = 100$. If the profit of producing $x = 25$ units is \$1000 what is the profit of producing $x = 100$ units?

10. A company's marginal cost function is given by $R'(x) = 4e^{x/2} + 2$ where x is the number of items produced in 1 day and $R'(x)$ is measured in thousands of dollars per item. Determine the net increase in revenue if the company decides to increase production from $x = 3$ to $x = 6$ items per day.

11. A demand curve for a certain commodity is given by $p(x) = \frac{x^3}{200} - 8x + 150$. What is the average price if the number of items varies from $x = 10$ to $x = 20$.

12. If money is deposited steadily in a savings account at the rate of \$4500 per year, determine the balance at the end of 1 year if the account pays 9% interest compounded continuously.