

# 235 TEST 3

You may use your notebook during the last half hour of this exam.  
You may NOT use calculators, cell phones, or peeking.

Math 235  
December 2, 2010

Name: \_\_\_\_\_  
By printing my name I pledge to uphold the honor code.

1. For each problem CIRCLE all that apply, and CROSS OUT all that do not apply. If you do nothing on an item I will assume that you meant to cross it out. Problems could possibly have one, many, or no answers to circle.

- a) Which of the following are true statements?

$$\sum_{k=1}^n a_k b_k = \sum_{k=1}^n a_k \sum_{k=1}^n b_k \qquad \sum_{k=0}^n k = \frac{n(n+1)}{2} \qquad \sum_{k=0}^{1000} k^2 = \sum_{k=1}^{1000} k^2$$

- b) Which of the following is a 20-rectangle Right Sum approximation for  $\int_2^6 f(x) dx$ ?

$$\sum_{k=1}^{20} f\left(2 + \frac{k}{100}\right)(0.1) \qquad \sum_{k=1}^{20} f\left(2 + \frac{k}{10}\right)(0.1) \qquad \sum_{k=1}^{20} f\left(2 + \frac{k}{100}\right)(0.01) \qquad \sum_{k=1}^{20} f\left(2 + \frac{k}{10}\right)(0.01)$$

- c) Which of the following can we integrate using the techniques covered so far in class?

$$\int \frac{1}{1+x} dx \qquad \int \frac{x}{1+x} dx \qquad \int \frac{x^2}{1+x} dx \qquad \int \frac{1}{1+x^2} dx \qquad \int \frac{x}{1+x^2} dx$$

- d) Which of the following are equivalent to the Fundamental Theorem of Calculus?

$$\left[ \int f'(x) dx \right]_a^b = \int_a^b f(x) dx \qquad \int_a^b G(x) dx = [G'(x)]_a^b \qquad \int_a^b h''(x) dx = [h'(x)]_a^b$$

2. Set up an  $n$ -rectangle Right Sum approximation and take the limit as  $n \rightarrow \infty$  to prove that  $\int_2^4 (3x + 1) dx = 20$ .
3. In each problem write the quantity described in terms of one or more definite integrals. Please do NOT try to solve the definite integrals; just write them down.
- a) The area between the graphs of  $\sin x$  and  $\cos x$  on the interval  $[-\frac{\pi}{2}, \frac{\pi}{2}]$ .
- b) The unsigned area of the region between the graph of  $f(x) = 4x^2 - 4x - 3$  and the  $x$ -axis on the interval  $[-2, 2]$ .
- c) The change in temperature, after 10 minutes, of a hot potato that is cooling at a rate of  $T'(t) = -15e^{-0.5t}$  degrees per minute.

4. Calculate each of the following definite and indefinite integrals. For these problems you *may* use the Fundamental Theorem of Calculus when needed.

a)  $\int \left( \frac{3}{x^2} - 4 \right) dx$

b)  $\int \frac{x^2}{x^3 + 1} dx$

c)  $\int_0^{\frac{\pi}{4}} 3 \sec^2 x \, dx$

d)  $\int_0^1 \frac{2}{e^{3x}} dx$

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**Survey for 2 bonus points:** What is a question or topic that could have been on this exam, but wasn't?

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