# Calc II - Problems off of past exams

The final exam is coming up. Here are some problems off of past exams to remember.

**Exam 1 - #2:** Evaluate the following integrals using the technique indicated.

(a) $\int xe^x dx$ - by parts

(b) $\int_{-1}^{1} x \sin(\cos(x^2))\, dx$ - with $u$-subs

**Exam 1 - #4** Suppose we wish to estimate

$$\int_0^1 \sin(x) dx$$

with an approximating sum and we'd like our result to be within 0.001 of the actual value using a midpoint sum.

(a) Find an $n$ large enough so that $n$ terms will guarantee your estimate is within the desired accuracy.

(b) Write down the resulting sum using summation notation.

(c) Is your sum an upper bound or a lower bound?

**Exam 1 - #5** Evaluate the following integrals using any technique that you see fit.

(a) $\int_0^3 \sqrt{9-x^2}\, dx$

(b) $\int x\sqrt{9-x^2}\, dx$

(c) $\int_0^{2\pi} \sin^4(x)\, dx$

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

**Exam 2 - #2** Let $f(x) = \cos(3x)$. Suppose we spin the region between the graph of $f$ over the interval $[0, \pi/6]$ about the $x$-axis. Find the volume of the resulting solid of revolution.

**Exam 2 - #3** Let $f(x) = \cos(3x)$. Suppose we spin the region between the graph of $f$ over the interval $[0, \pi/6]$ about the $y$-axis. Find the volume of the resulting solid of revolution.

**Exam 2 - #4** Suppose I need to exert a force of 5 N to stretch a spring 0.5 meters past its natural length. How much work does it take to get it there from its natural postion?

**Exam 2 - #6** Use $u$-substitution to translate the following normal integral into a standard normal integral:

$$\frac{1}{\sqrt{2\pi}\,5} \int_0^4 e^{-(x-1)^2/50} dx.$$

**Exam 3 - #1** Use the geometric series formula to express

$$\sum_{n=3}^{\infty} (-1)^{n+1} \frac{2^n}{3^{n-1}}$$

as a simple, finite combination of fractions.

**Exam 3 - #3** Use the integral test to show that

$$\sum_{n=1}^{\infty} \frac{1}{n}$$

diverges.
Note: You do need to evaluate an integral for this problem.

**Exam 3 - #5** Write down a couple of complete sentences using the comparison test to show that

$$\sum_{n=1}^{\infty} \frac{\cos^2(n)}{n^3+1}$$

converges.

**Exam 3 - #7** Classify the following series as absolutely convergent, conditionally convergent, or divergent.

(a) $\sum (-1)^n \frac{\cos(n)}{2}$

(b) $\sum (-1)^n \frac{n}{n^2+1}$

(c) $\sum (-1)^n \frac{\cos(n)}{n^3+1}$

(d) $\sum \frac{n^3}{3^n}$