Calculus I **Integrals, antiderivatives, and the FTC** **Fall 2014**

Discussion session 23 - 11 November 2014

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1. Describe the following terms and phrases in your owns words.

   (a) even function, odd function

   (b) antiderivative of a function

   (c) fundamental theorem of calculus

2. (a) Give 3 antiderivatives of the function $f(x) = \frac{1}{x}$.

   (b) What is the antiderivative of the antiderivative of $g(y) = 4y^3 - 5y^{-3}$?

   (c) True or false: The antiderivative and indefinite integral of a function are the same.

   (d) True or false: The antiderivative of a function is unique.

   (e) True or false: An even function cannot be the antiderivative of an odd function.

3. Which of the following expressions do not make mathematical sense, and why?

(a) $\int_{-2}^{2} 4d^2 + 5d$

(b) $\iiint abc \; da \; db \; dc$

(c) If $g(z) = f'(z)$, find $\int g(z)^2 dz$.

(d) $\lim_{n\to\infty} \left[\int_{-n}^{n} \frac{1}{x^2} dx\right] = \left(\left(\frac{-1}{n} + C\right) - \left(\frac{-1}{-n} + C\right)\right) = \frac{-2}{n} = \frac{-2}{\infty} = 0$

4. Simplify the following expressions.

(a) $\int_{-\pi}^{3\pi} \sin(t) + 2\cos(t) dt$

(b) The integral of $h(k) - \ell$ from $2k + 2$ to 5, with respect to ℓ.

(c) $\left(\int_{z^2}^{3z^3+2} e^{w^2} dw\right)'$

5. Evaluate the following integrals using substitution or other tactics you have learned.

(a) $\int_{-1}^{1} \frac{x}{\sqrt{2x^2+3}} dx$

(b) $\int \frac{dt}{t((\ln t)^2 + 1)}$

(c) $\int_{\ln 3}^{\ln 8} \frac{e^x}{\sqrt[3]{e^x + 1}} dx$

(d) $\int \theta^3 \cos(2\theta^4 + 1) d\theta$

(e) $\int_{(\pi/2)^2}^{(3\pi/2)^2} \frac{\cos(\sqrt{t})}{\sqrt{t}} dt$

(f) $\int_{0}^{2} x(x^2+1)^{99} dx$