## Problem Set 8

2019 Math Boot Camp for the Political and Social Sciences

## Deeper Thinking

- 1. We saw that we have the method of substitution to serve as a "reverse" to the Chain rule. Is there a reverse to the Product rule?
- 2. Compute  $\int \log(x) dx$ .
- 3. If one takes 3 random points on a circle and connects them to make a triangle, what is the probability that the center of the circle is contained inside the triangle?

## Some practice

1. Compute the following integrals:

(a) 
$$\int_{0}^{3} e^{x} dx$$
  
(b) 
$$\int 4\cos(x) dx$$
  
(c) 
$$\int \frac{1}{x} - \sin(x) dx$$

2. After making the provided substitution, compute the following integrals, then convert back to the original variable:

(a) 
$$\int \frac{1}{1-x} dx$$
 with  $u = 1-x$ .  
(b)  $\int 2x \cos(x^2 + 1) dx$  with  $u = x^2 + 1$ .  
(c)  $\int \frac{1}{x \log(x)^5} dx$  with  $u = \log(x)$ .

- 3. The well-known Advanced Calculus political party is very popular, but we will follow their dwindling success in terms of number of months t. At the beginning of February, which we call t = 1, they have an approval rating of 80%. The rate of change of their approval percentage over t months is given by  $f(t) = \frac{-20}{t}$ . What will their approval rating be by the end of the year?
- 4. Read the exercises from Chapter 7 in [Moore-Siegel] and either do them or thoroughly convince yourself they're not worth your time.