Worksheet 1

15 January 2019

1. What are the names of the members of your group?

2. Recall the following differentiation rules and write down their formulas.

   (a) Power rule

   (b) Exponential rule

   (c) Product rule

   (d) Quotient rule

   (e) Chain rule

   (f) Bonus: Come up with a function whose derivative requires using all of the rules above.

3. Differentiate the folllowing functions with respect to the appropriate variable. Let c be some fixed constant.

   (a) $f(x) = x\cos(x^2)$

   (b) $F(x) = \frac{x^3}{9}(3\ln(x) - 1)$

   (c) $\varphi(w) = e^{3w}/\ln(w)$

   (d) $h(v) = \sum_{k=1}^{1726} v^k$

   (e) $g(y) = ye^{\sqrt{y}}$

   (f) $H(z) = \arcsin(3z + 1)$

   (g) $\psi(x) = x^c + c^x$

   (h) $M(s) = \dfrac{c^2 - s^2}{\sqrt{c^2 + s^2}}$

4. Share with your group: What is your current major of study, what you would like to achieve in ESP, and what do you see yourself doing after college? What you think is most important about a college education? Write down your favorite responses.

5. Recall the fundamental theorem of calculus (FTC).

   (a) What does it mean for a function to be *differentiable*? To be *integrable*?

   (b) What is the statement of the FTC (parts 1 and 2)?

   (c) Using the FTC, find
   $$\frac{d}{dx} \int_0^x \sin(e^{t^2}) \, dt.$$

   (d) Let f, a, b be continuous and integrable functions. Using the FTC, find
   $$\frac{d}{dx} \int_{a(x)}^{b(x)} f(t) \, dt.$$