This weightless assignment is due on Crowdmark by Monday, November 16, at 9:00pm EST. It does not count toward your course grade.

Exercise 1. Read Spivak Chapter 10, "Derivatives."

(a) Using the product, quotient, sum, and chain rules, compute the derivative of:

- $f(x) := \sin(\cos(x^2))$.
- $f(x) := \frac{1+x^2\cos x}{x-\sin x}$.

(b) In what assignment did we prove: the function $h(x) := \sqrt{x}$ is differentiable at all $x > 0$, and $h'(x) = \frac{1}{2\sqrt{x}}$? Using this fact, differentiate $f(x) := \sqrt{\frac{x+1}{x-1}}$ (be careful when simplifying).

(c) Define

$$F(x) := \begin{cases} \frac{1}{x} + 2 & \text{if } x > 0 \\ \frac{1}{x} + 7 & \text{if } x < 0. \end{cases}$$

What is $F'(x)$? Can you find another function G such that $G'(x) = F'(x)$? [Extra: Can you guess what every such G might be defined?]

Exercise 2. Read Spivak Chapter 12, "Inverse Functions," up to but not including Theorem 4. Consider the function $f(x) := \sqrt{|x|}$. Draw it.

(a) Does f have an inverse? If so, give it and draw it. If not, find an interval $A \subseteq \mathbb{R}$ on which $f|_A$ does have an inverse, give it and draw it. Can we conclude that $(f|_A)^{-1}$ is continuous without appealing to the formula for $(f|_A)^{-1}$ (i.e. are there any helpful theorems we can use)?

(b) Is there any point x in $\mathbb{R}$ such that for every $\delta > 0$, the restriction $f|_{(x-\delta,x+\delta)}$ has no inverse?