**Williams College**
**Department of Mathematics and Statistics**

# MATH 140 : CALCULUS II

**Problem Set 4 – due Friday, February 21st**

## INSTRUCTIONS:
Please submit this at the *start* of Friday's class. Don't worry if you don't manage the get an answer for any particular question, but please give each problem an honest try (and record what you were able to accomplish, even if you didn't solve it). Eventually you should make sure to understand the problems, as some of them may appear on next week's in-class quiz. You are encouraged to collaborate with other students on these problems. However, please write up your solutions in isolation from one another.

**4.1** Evaluate $\frac{d}{dx} f\big(g(x)^2\big)$.

**4.2** What's $(x^{5/7})^7$? Use this to evaluate $\frac{d}{dx} x^{5/7}$.

**4.3** Let $f(x) = \sin x$, where $x$ is in *degrees*. Thus, for example, $f(90) = 1$. Approximate $f'(0)$ as best you can. (Is it positive or negative? Huge or tiny? Bigger than 1, or smaller than 0.1?)

**4.4** The goal of this exercise is to show that the quotient rule is really just a combination of the product and chain rules.

(a) Use the chain rule to determine $\dfrac{d}{dx}\left(\dfrac{1}{g(x)}\right)$.

(b) Use the product rule to show that $\dfrac{d}{dx}\dfrac{f(x)}{g(x)} = \dfrac{f'(x)g(x) - f(x)g'(x)}{g(x)^2}$. [*Needless to say, please don't use the quotient rule to answer this question.*]