MATH 210: HOMEWORK 3
DUE MONDAY 9/16

Problem Set

Monday. Differentiate the following functions.

(1) $a(x) = x^e + e^x$
(2) $b(x) = \frac{12}{\sqrt[4]{x^5}}$
(3) $c(x) = 2 - \sin x$
(4) $d(x) = \pi \cos x + \pi x + \frac{x}{\pi}$
(5) $f(x) = \frac{1}{x^3} - e^2 \cdot e^x$

Wednesday. Differentiate the following functions.

(1) $a(x) = x^3 e^x$
(2) $b(x) = \sqrt{x} \sec x$
(3) $c(x) = x \ln x - x$
(4) $d(x) = (\sin x + x)(\sec x - \frac{1}{x})$

Find the following second derivatives.

(5) $a''(x)$
(6) $c''(x)$

Friday. Differentiate the following functions.

(1) $a(x) = \tan(\arccos x)$
(2) $b(x) = e^{e^{e^{e^x}}}$
(3) $c(x) = (x^2 - 1)^3$
(4) $d(x) = \log_2(\tan x)$

For the following, let k be a constant.

(5) Differentiate $f_1(x) = e^{kx}$.
(6) Differentiate $f_2(x) = \sin(kx)$.
(7) Differentiate $f_3(x)\sqrt{kx}$.
(8) Build on these ideas to come up with a rule for the derivative of $f(kx)$, where f is an arbitrary differentiable function.

Writing Exercise

Use the definition of the derivative to explain why the sum rule $\frac{\mathrm{d}}{\mathrm{d}x}\left(f(x)+g(x)\right) = f'(x)+g'(x)$ is valid.

Extra credit: Use the definition of the derivative to explain why the power rule $\frac{\mathrm{d}}{\mathrm{d}x}\, x^n = nx^{n-1}$, where n is a positive integer, is valid.