Homework #4

(1) Find the derivative of the following functions (I'll do the first one for you). Also, if you need hints, just shoot me an email. I'll be happy to help.

(1.a) Find the derivative of $f(x) = 5(1+4x)^2 + 3x$.

$$\begin{aligned}
\frac{\mathrm{d}}{\mathrm{d}x}(f(x)) &= \frac{\mathrm{d}}{\mathrm{d}x}(5(1+4x)^2) \\
&= 5\frac{\mathrm{d}}{\mathrm{d}x}((1+4x)^2) \\
&= 5 \cdot 2(1+4x)^{1-1} \cdot \frac{\mathrm{d}}{\mathrm{d}x}(1+4x) \\
&= 10(1+4x) \cdot \frac{\mathrm{d}}{\mathrm{d}x}(1+4x) \\
&= 10(1+4x) \cdot 4 \\
&= 40(1+4x).
\end{aligned}$$

(1.b) Find the derivative of $f(x) = \ln(\ln(x))$.

$$\frac{\mathrm{d}}{\mathrm{d}x}(f(x)) =$$

(1.c) Find the derivative of $f(x) = e^{e^x}$.

$$\frac{\mathrm{d}}{\mathrm{d}x}(f(x)) =$$

(1.d) Find the derivative of $f(x) = x\ln(3x)$.

$$\frac{\mathrm{d}}{\mathrm{d}x}(f(x)) =$$

(1.e) Find the derivative of $f(x) = \ln(x + 2x^2)$.

$$\frac{\mathrm{d}}{\mathrm{d}x}(f(x)) =$$

(1.f) Find the derivative of $f(x) = \frac{10.2}{1+12.1e^{0.3x}}$. (hint: rewrite $f(x)$ as $10.2(1 + 12.1e^{0.3x})^{-1}$)

$$\frac{\mathrm{d}}{\mathrm{d}x}(f(x)) =$$

(1.g) Find the derivative of $f(x) = \sqrt{3x^4 - 2x^3 - 1}$.

$$\frac{\mathrm{d}}{\mathrm{d}x}(f(x)) =$$

(1.h) Find the derivative of $f(x) = \frac{e^{3x}}{(5x^4-1)^2}$.

$$\frac{\mathrm{d}}{\mathrm{d}x}(f(x)) =$$

(1.g) Let $f(x) = g(x)h(x)$ and suppose

$$\begin{aligned} g(5) &= 3 \\ g'(5) &= 2 \\ h(5) &= 4 \\ h'(5) &= 6 \end{aligned}$$

What is $f'(5)$?