1 October 2014 The Chain Rule

(1) Practice the chain rule by differentiating the following functions. (a) $f(x) = (10 - 5x)^4$

(b)
$$g(x) = e^{x^2}$$

(c)
$$F(x) = \frac{1}{x^{1/2} + x^{3/2}}$$
 (do this one without using the quotient rule)

(d)
$$G(x) = (3x+5)^{100}(4x-6)^{200}$$

(2) Suppose $h(x) = \sqrt{4+3f(x)}$ where f(1) = 7 and f'(1) = 4. Find h'(1).

(3) Practice the chain, chain, chain rule by differentiating the following functions. (a) $g(x) = e^{(4x^2 - 10)^3}$

(b)
$$h(x) = \left(\frac{e^{x^2}}{x+1}\right)^5$$

(4) A table of values for f, g, f', g' is given below.

x	f(x)	g(x)	f'(x)	g'(x)
1	3	2	4	6
2	1	8	5	7
3	7	2	7	9

(a) If h(x) = f(g(x)), find h'(1).

(b) If
$$H(x) = g(h(x))$$
, find $H'(1)$.

(5) For what values of r does the function $y = e^{rx}$ satisfy the differential equation y'' - 4y' + y = 0?