MA 22000 Lesson 18 Notes
(Calculus part of text) Section 4.3 (part 2)
The Chain Rule

Chain Rule Forms:

If $y = f(u)$ and $u = g(x)$, such that $y = f(u) = f[g(x)]$, then

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx} \quad or \quad \frac{dy}{dx} = f'[g(x)] \cdot g'(x)$$

Derivative of a composite function = derivative of the 'outer' function (with respect to u or $g(x)$)times the derivative on the 'inner' function (with respect to x).

1) Use the table below to find: (a) $D_x(g[f(x)])$ at $x = 2$, (b) $D_x(g[f(x)])$ at $x = 1$.

x	1	2	3	4
$f(x)$	2	3	1	2
$f'(x)$	-8	-9	-10	-11
$g(x)$	2	1	4	3
$g'(x)$	0	5	6	9

a) $D_x(g[f(x)])$ (at $x = 2$) = $g'[f(2)] \cdot f'(2)$

b)

Find the equation of the tangent lines to the graph of the given function at the given value of *x*.

2) $f(x) = (x^3 + 1)^{\frac{3}{2}}$ for $x = 2$

3) $g(x) = x^2\sqrt{x^4 - 12}$ for $x = 2$

Find all values of *x* for the given functions where the tangent line is horizontal.

4) $f(x) = 2\left(\dfrac{3x-6}{5x}\right)^2$

5) $h(x) = 2\sqrt{x} - \left(\sqrt{x}\right)^5$

6) A sum of \$2500 is deposited in an account with an interest rate of r% per year, compounded daily. At the end of 5 years, the balance in the account is given by $A = 2500\left(1+\frac{r}{36500}\right)^{1825}$. Find the rate of change of A with respect to r if r = 4%.

7) The value V of a machine t years after it is purchased is given by the equation $V(t) = \frac{10000}{\sqrt{t+1}}$. Find the rate of depreciation when (a) t = 1 and when (b) t = 3.