9.2.1 To Determine the first derivative of the function $y = ax^n$ using formula.

Example		Exercise					
1	$y = x^3$ $\frac{dy}{dx} = 3x^{3-1}$ $= 3x^2$	a	$y = x^4$ $\frac{dy}{dx} =$ [$4x^3$]	b	$y = x^5$ [$5x^4$]	c	$y = x^7$ [$7x^6$]
2	$y = 2x^3$ $\frac{dy}{dx} = 3 \times 2x^2$ $= 6x^2$	a	$y = 3x^4$ $\frac{dy}{dx} = 4 \times$ [$12x^3$]	b	$y = 5x^3$ [$15x^2$]	c	$y = 10x^2$ [$20x$]
3	$y = -2x^3$ $\frac{dy}{dx} = 3 \times (-2)x^2$ $= -6x^2$	a	$y = -5x^4$ $\frac{dy}{dx} =$ [$-20x^3$]	b	$y = -8x^5$ [$-40x^4$]	c	$y = -12x^2$ [$-24x$]
4	$f(x) = x^{-2}$ $f'(x) = -2 \times x^{-2-1}$ $= -2x^{-3}$	a	$f(x) = x^{-1}$ $f'(x) =$ [$-\frac{1}{x^2}$]	b	$f(x) = x^{-5}$ $f'(x) =$ [$-\frac{5}{x^6}$]	c	$f(x) = x^{-3}$ $f'(x) =$ [$-\frac{6}{x^2}$]
5	$f(x) = 3x^{-2}$ $f'(x) = -2 \times 3x^{-2-1}$ $= -6x^{-3}$	a	$f(x) = 4x^{-1}$ $f'(x) =$ [$-\frac{4}{x^2}$]	b	$f(x) = 2x^{-4}$ $f'(x) =$ [$-\frac{8}{x^5}$]	c	$f(x) = 6x^{-1}$ $f'(x) =$ [$-\frac{6}{x^2}$]
6	$y = \frac{1}{2}x^4$ $\frac{dy}{dx} = 4 \times \frac{1}{2}x^{4-1}$ $= 2x^3$	a	$y = \frac{3}{2}x^4$ $\frac{dy}{dx} =$ [$6x^3$]	b	$y = \frac{1}{3}x^6$ [$2x^5$]	c	$y = -\frac{1}{6}x^{-3}$ [$\frac{1}{2x^4}$]
7	$y = -\frac{2}{3}x^3$ $\frac{dy}{dx} = 3 \times \frac{2}{3}x^{3-1}$ $= 2x^2$	a	$y = -\frac{2}{3}x^{-6}$ $\frac{dy}{dx} =$ [$\frac{4}{x^7}$]	b	$f(x) = \frac{5}{2x}$ $f'(x) =$ [$-\frac{5}{2x^2}$]	c	$f(x) = \frac{4}{3x^6}$ $f'(x) =$ [$-\frac{8}{x^7}$]

9.2.3 Determine first derivative of a function involving : (a) addition, or (b) subtraction of algebraic terms.

	Example	Exercise			
1.	$y = x^2 + 3x + 4$ $\frac{dy}{dx} = 2x + 3$	a.	$y = x^2 + 4x + 3$ [2x+4]	b.	$y = x^2 + 5x + 6$ [2x+5]
2.	$y = x^2 - 3x + 4$ $\frac{dy}{dx} = 2x - 3$	a.	$y = x^2 - 4x + 3$ [2x-4]	b.	$y = x^2 - 5x + 6$ [2x-5]
3.	$y = x^3 + 4x^2 + 5$ $\frac{dy}{dx} = 3x^2 + 8x$	a.	$y = x^3 + 5x^2 + 7$ [$3x^2$ +10x]	b.	$y = x^3 + 6x^2 + 8$ [$3x^2$ + 12x]
4.	$y = x^3 - 3x^2 - 6$ $\frac{dy}{dx} = 3x^2 - 6x$	a.	$y = x^3 - 5x^2 - 7$ [$3x^2$-10x]	b.	$y = x^3 - 6x^2 - 8$ [$3x^2$ -12x]
5.	$y = x(x + 5)$ $y = x^2 + 5x$ $\frac{dy}{dx} = 2x + 5$	a.	$y = x(x - 6)$ [2x-6]	b.	$y = x^2(x + 5)$ [$3x^2$ + 10x]
6.	$y = (x+1)(x + 5)$ $y = x^2 + 6x + 5$ $\frac{dy}{dx} = 2x + 6$	a.	$y = (x+1)(x - 6)$ [2x-5]	b.	$y = (x^2 + 1)(x - 4)$ [$3x^2$ -8x+1]
7.	$y = (x+3)^2$ $y = x^2 + 6x + 9$ $\frac{dy}{dx} = 2x + 6$	a.	$y = (x+4)^2$ [2(x+4)]	b.	$y = (3x+1)^2$ [6(3x+1)]
8.	$y = x(x+3)^2$ $y = x(x^2 + 6x + 9)$ $y = x^3 + 6x^2 + 9x$ $\frac{dy}{dx} = 3x^2 + 12x + 9$	a.	$y = x(x+4)^2$ [$3x^2$ + 16x+16]	b.	$y = x(3x+1)^2$ [$27x^2$ +12x+1]

	Example		Exercise		
9.	$y = x^2 + \frac{3}{x}$ $y = x^2 + 3x^{-1}$ $\frac{dy}{dx} = 2x - 3x^{-2}$ $\frac{dy}{dx} = 2x - \frac{3}{x^2}$	a.	$y = x^2 + \frac{5}{x}$ $[2x - \frac{5}{x^2}]$	b.	$y = x^3 - \frac{4}{x}$ $[3x^2 + \frac{4}{x^2}]$
10.	$y = x^2 + \frac{3}{x} + \frac{4}{x^2}$ $y = x^2 + 3x^{-1} + 4x^{-2}$ $\frac{dy}{dx} = 2x - 3x^{-2} - 8x^{-3}$ $\frac{dy}{dx} = 2 - \frac{3}{x^2} - \frac{8}{x^3}$	a	$y = x^2 + \frac{5}{x} + \frac{6}{x^2}$ $[2x - \frac{5}{x^2} - \frac{12}{x^3}]$	b.	$y = x^3 - \frac{4}{x} - \frac{5}{x^2}$ $[3x^2 + \frac{4}{x^2} + \frac{10}{x^3}]$
11.	$y = \frac{x^3 + 4x + 5}{x}$ $y = x^2 + 4 + 5x^{-1}$ $\frac{dy}{dx} = 2x - 5x^{-2}$ $\frac{dy}{dx} = 2x - \frac{5}{x^2}$	a.	$y = \frac{x^3 + 5x - 6}{x}$ $[2x + \frac{6}{x^2}]$	b.	$y = \frac{x^3 - 2x - 7}{x}$ $[2x + \frac{7}{x^2}]$
12.	$y = \frac{x^3 + 4x + 5}{x^2}$ $y = x + 4x^{-1} + 5x^{-2}$ $\frac{dy}{dx} = 1 - 4x^{-2} - 10x^{-3}$ $\frac{dy}{dx} = 1 - \frac{4}{x^2} - \frac{10}{x^3}$	a.	$y = \frac{x^3 + 5x - 6}{x^2}$ $[1 - \frac{5}{x^2} + \frac{12}{x^3}]$	b.	$y = \frac{x^3 - 2x - 7}{x^2}$ $[1 + \frac{2}{x^2} + \frac{14}{x^3}]$

9.2.4 To determine the first derivative of a product of 2 polynomial.

	Example		Exercise				
1	$y = x(x^3+1)$ $u=x$, $v=x^3+1$ $\frac{du}{dx}=1,\ \frac{dv}{dx}=3x^2$ $\frac{dy}{dx}=\frac{d}{dx}(uv)$ $=u\frac{dv}{dx}+v\frac{du}{dx}$ $= x(3x^2)+(x^3+1)(1)$ $=3x^3+x^3+1$ $= 4x^3+1$	a	$y = x(x^4+2)$ $[5x^4+2]$		$y = (x^5+1)x$ $[6x^5+1]$	c	$y = (x^3-1)x$ $[4x^3-1]$
2	$y = 2x^2(x^3+1)$ $u=2x^2$, $v=x^3+1$ $\frac{du}{dx}=4x\ \frac{dv}{dx}=3x^2$ $\frac{dy}{dx}=\frac{d}{dx}(uv)$ $=u\frac{dv}{dx}+v\frac{du}{dx}$ $=$ $2x^2(3x^2)+(x^3+1)(4x)$ $=6x^4+4x^4+4x$ $= 10x^4+4x$	a	$y = 3x^2(x^3-1)$ $[15x^4-6x]$	b	$y = (x^3-1)(5x^2)$ $[25x^4-10x]$	c	$y = (x^3-1)(-4x^2)$ $[-20x^4+8x]$
3	$f(x)=(x+1)(x^3+1)$ $u=x+1$, $v=x^3+1$ $\frac{du}{dx}=1\ \frac{dv}{dx}=3x^2$ $f'(x)=\frac{d}{dx}(uv)$ $=u\frac{dv}{dx}+v\frac{du}{dx}$ $=$ $(x+1)(3x^2)+(x^3+1)(1)$ $=3x^3+3x^2+x^3+1$ $= 4x^3+3x^2+1$	a	$f(x)=(x-1)(1+x^3)$ $[4x^3-3x^2+1]$	b	$f(x)=(1-x)(x^3+2)$ $[-4x^3+3x^2-2]$	c	$f(x)=(2-x)(x^3+3)$ $[-4x^3+6x^2-3]$

4	y= (x+1) ($\frac{x}{2}$+1) u=x+1 , v = $\frac{x}{2}$+1 $\frac{du}{dx}=1$ $\frac{dv}{dx}=\frac{1}{2}$ $\frac{dy}{dx}=\frac{d}{dx}(uv)$ $=u\frac{dv}{dx}+v\frac{du}{dx}$ = (x+1)($\frac{1}{2}$)+ ($\frac{x}{2}+1$)(1) $=\frac{1}{2}x+\frac{1}{2}+\frac{1}{2}x+1$ $=x+1\frac{1}{2}$	a	y= (x-1) ($\frac{x}{3}$+1) [$\frac{2}{3}x+\frac{2}{3}$]	b	y= (2x+1) ($\frac{x}{2}$+1) [2x+ $2\frac{1}{2}$]	c	y= (3-2x) (2- $\frac{x}{2}$) [2x-5 $\frac{1}{2}$]
5	y= (x^2+1) ($\frac{x}{2}$+1) u=x^2+1 , v = $\frac{x}{2}$+1 $\frac{du}{dx}=2x$ $\frac{dv}{dx}=\frac{1}{2}$ $\frac{dy}{dx}=\frac{d}{dx}(uv)$ $=u\frac{dv}{dx}+v\frac{du}{dx}$ = (x^2+1)($\frac{1}{2}$)+ ($\frac{x}{2}+1$)(2x) $=\frac{1}{2}x^2+\frac{1}{2}+x^2+2x$ $=\frac{3}{2}x^2+2x+\frac{1}{2}$	a	y= (x^4+1) ($\frac{x}{3}$+1) [$\frac{5}{3}x^4+4x^3+\frac{1}{3}$]	b	y= (2+x^2) ($\frac{x}{4}$-1) [$\frac{3}{4}x^2-2x+\frac{1}{2}$]	c	y= (3-x^3) ($\frac{x}{3}$+1) [-$\frac{4}{3}x^3-3x^2+1$]

9.2.5 To determine the first derivative of a quotient of two polynomials using formula

Example : $y = \frac{x}{x+1}$ $u = x \qquad v = x+1$ $\frac{dy}{dx} = 1 \qquad \frac{dv}{dx} = 1$ $\frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$ $= \frac{(x+1)1 - x(1)}{(x+1)^2}$ $= \frac{x+1-x}{(x+1)^2}$ $= \frac{1}{(x+1)^2}$	1. $y = \frac{5x}{2x+3}$ $\frac{15}{(2x+3)^2}$
2. $y = \frac{3x}{4x+5}$ $\frac{15}{(4x+5)^2}$	3. $y = \frac{6x}{2x-7}$ $-\frac{42}{(2x-7)^2}$

4. y = $\dfrac{5x + 4}{3x - 2}$ $-\dfrac{22}{(3x-2)^2}$	5. y = $\dfrac{1-4x}{1+x}$ $-\dfrac{5}{(1+x)^2}$
6. $y = \dfrac{1-x}{1-2x}$ $\dfrac{1}{(1-2x)^2}$	7. y = $\dfrac{x^2}{x-3}$ $\dfrac{x}{x-3}$

8. $y = \dfrac{3x^2}{1-5x}$ $\dfrac{6x-15x^2}{(1-5x)^2}$	9. $y = \dfrac{4x^3}{x^2+10}$ $\dfrac{4x^4+120x^2}{(x^2+10)^2}$
10. $y = \dfrac{5x^2 - 3x}{8 + x^3}$ $\dfrac{-5x^4+6x^3+80x-24}{(8+x^3)^2}$	11. $y = \dfrac{x^2-1}{5x^3-4}$ $\dfrac{-5x^4+15x^2-8x}{(5x^3-4)^2}$

9.2.6 Determine the first derivative of composite function using chain rule.

Example		Exercise					
1	$y=(x+2)^2$ $\frac{dy}{dx}=2(x+2)^1\times 1$ $=2(x+2)$	a	$y=(x+3)^4$ [$4(x+3)^3$]	b	$y=(x+2)^5$ [$5(x+2)^4$]	c	$y=(x+8)^3$ [$3(x+8)^2$]
2	$y=(3x+2)^2$ $\frac{dy}{dx}=2\times(3x+2)^1\times 3$ $=6(3x+2)$	a	$y=(2x+3)^4$ [$8(2x+3)^3$]	b	$y=(4x+2)^5$ [$20(4x+2)^4$]	c	$y=(5x+8)^3$ [$15(5x+8)^2$]
3	$y=2(x+2)^2$ $\frac{dy}{dx}=2\times 2(x+2)^1\times 1$ $=4(x+2)$	a	$y=5(x+2)^4$ [$20(x+2)^3$]	b	$y=3(4x+2)^5$ [$60(4x+2)^4$]	c	$y=2(2x+8)^3$ [$12(2x+8)^3$]
4	$y=\frac{2}{(x+2)^2}$ $y=2(x+2)^{-2}$ $\frac{dy}{dx}=-2\times 2(x+2)^{-3}$ $=-4(x+2)^{-3}$ $=\frac{-4}{(x+2)^3}$	a	$y=\frac{5}{(x+2)^4}$ [$-\frac{20}{(x+2)^5}$]	b	$y=\frac{3}{(x+2)^5}$ [$-\frac{15}{(x+2)^6}$]	c	$y=\frac{2}{(x+8)^3}$ [$-\frac{6}{(x+8)^4}$]
5	$y=\frac{2}{5(x+2)^2}$ $y=\frac{2(x+2)^{-2}}{5}$ $\frac{dy}{dx}=-2\times\frac{2(x+2)^{-3}}{5}\times 1$ $=\frac{-4(x+2)^{-3}}{5}$ $=\frac{-4}{5(x+2)^3}$	a	$y=\frac{3}{4(x+5)^3}$ [$-\frac{9}{4(x+5)^4}$]	b	$y=\frac{4}{5(2x-3)^6}$ [$-\frac{24}{5(2x-3)^7}$]	c	$y=-\frac{5}{2(3x-4)^4}$ [$\frac{10}{(3x-4)^5}$]