Calculus Chapter 1
Notes 1.1 The Derivative

- As we saw from last chapter, the **derivative** of a function f(x) is the instantaneous rate (or velocity) at any given time, denoted by $f'(x)$.
- The value of the derivative of f(x) at x = c equals the **slope of the tangent line** to the graph of f at x = c.

Power Rule to find Derivative
If $f(x) = x^n$, then $f'(x) = nx^{n-1}$
Multiply by the original exponent and decrease the exponent by 1.

- The process of finding a derivative is called differentiation.

Differentiate.

1. $f(x) = x^2 - 4x + 2$

$f'(x) = 2x - 4$

2. $y = 3x^4 - 2x^3 + 4x^2 - 6$

$y' = 12x^3 - 6x^2 + 8x$

3. $f(x) = \frac{1}{x^4} = x^{-4}$

$f'(x) = -4x^{-5}$

4. $y = \frac{1}{\sqrt{x+1}} = \frac{1}{(x+1)^{\frac{1}{2}}} = (x+1)^{-\frac{1}{2}}$

$y' = -\frac{1}{2}(x+1)^{-\frac{3}{2}}$

For #5-6:
a) Find the slope of the curve (derivative) at the given point P
b) Then find the equation of the tangent line at that point.

5. $y = 3x^2 - 2x + 6$ P(3, 18)

a) $y' = 6x - 2$ $m \Rightarrow 6(3) - 2 = 16$

b) $y = mx + b$ $27 = 16(3) + b$ $27 = 48 + b$ $b = -21$ $y = 16x - 21$

6. $y = 2x^3$ P(-1, -2)

a) $y' = 6x^2$ $m = 6(-1)^2 = 6$

b) $y = mx + b$ $-2 = 6(-1) + b$ $-2 = -6 + b$ $b = 4$ $y = 6x + 4$