

# Derivative Applications

## 3.3 – Higher Order Derivatives

### Newton Notation

1 <sup>st</sup> Derivative	$f'$ or $y'$
2 <sup>nd</sup> Derivative	$f''$ or $y''$
3 <sup>rd</sup> Derivative	$f'''$ or $y'''$
4 <sup>th</sup> Derivative	$f^{(4)}$ or $y^{(4)}$
N <sup>th</sup> Derivative	$f^{(n)}$ or $y^{(n)}$

Ex A: Find the first four derivatives of each function.

#1)  $f(x) = x^4 - x^3 + 6x^2 - x + 1$  (Use Newton)

#2)  $y = 3x^{-1/2}$  (Use Newton)

### Leibniz Notation

1 <sup>st</sup> Derivative	$\frac{dy}{dx}$ or $\frac{d}{dx}f$
2 <sup>nd</sup> Derivative	$\frac{d^2y}{dx^2}$ or $\frac{d^2}{dx^2}f$
3 <sup>rd</sup> Derivative	$\frac{d^3y}{dx^3}$ or $\frac{d^3}{dx^3}f$
4 <sup>th</sup> Derivative	$\frac{d^4y}{dx^4}$ or $\frac{d^4}{dx^4}f$
N <sup>th</sup> Derivative	$\frac{d^ny}{dx^n}$ or $\frac{d^n}{dx^n}f$

#3)  $f(x) = x^3 - 2x^2 + 6x - 11$  (Use Leibniz)

#4)  $y = \frac{1}{x}$  (Use Leibniz)

#5)  $\frac{d^2}{dx^2}(x^3 + x^2 + x - 1)|_{x=1}$

