You will often use these root, exponent and fraction properties to simplify before finding the derivative:

$\sqrt{x} = x^{1/2}$ $\sqrt[n]{x^m} = x^{m/n}$ $\frac{1}{x} = x^{-1}$ $\frac{1}{x^n} = x^{-n}$ $\frac{a+c}{b} = \frac{a}{b} + \frac{c}{b}$

Derivative Rules

	Rule:	**Example:**
Constant Rule	Function: $f(x) = c$ Derivative: $f'(x) = 0$	Function: $f(x) = 7$ Derivative: $f'(x) = 0$
Power Rule:	Function: $f(x) = x^n$ Derivative: $f'(x) = nx^{n-1}$	Function: $f(x) = x^4$ Derivative: $f'(x) = 4x^3$
	Function: $f(x) = x$ Derivative: $f'(x) = 1$	
Constant Multiple Rule:	Function: $f(x) = cx^n$ Derivative: $f'(x) = c \cdot nx^{n-1}$	Function: $f(x) = 7x^4$ Derivative: $f'(x) = 28x^3$
	Function: $f(x) = cx$ Derivative: $f'(x) = c$	Function: $f(x) = 6x$ Derivative: $f'(x) = 6$
Sum and Difference Rule:	Function: $f(x) = u \pm v$ Derivative: $f'(x) = u' \pm v'$	Function: $f(x) = 3x^6 - 4x$ Derivative: $f'(x) = 18x^5 - 4$
Product Rule:	Function: $f(x) = uv$ Derivative: $f'(x) = uv' + vu'$ or $f'(x) = u'v + v'u$	Function: $f(x) = (x^2 + x)(3x + 1)$ Derivative: $f'(x) = (x^2 + x)(3) + (3x + 1)(2x + 1)$ $= 3x^2 + 3x + 6x^2 + 3x + 2x + 1$ $= 9x^2 + 8x + 1$
Quotient Rule:	Function: $f(x) = \frac{u}{v}$ Derivative: $f'(x) = \frac{vu' - uv'}{v^2}$ or $f'(x) = \frac{u'v - v'u}{v^2}$	Function: $f(x) = \frac{5x-2}{4x+3}$ Derivative: $f'(x) = \frac{(4x + 3)(5) - (5x - 2)(4)}{(4x + 3)^2}$ $= \frac{20x + 15 - (20x - 8)}{(4x + 3)^2}$ $= \frac{23}{(4x + 3)^2}$
General Power Rule:	Function: $f(x) = u^n$ Derivative: $f'(x) = nu^{n-1} \cdot u'$	Function: $f(x) = (2x^3 - 7x)^4$ Derivative: $f'(x) = 4(2x^3 - 7x)^3(6x^2 - 7)$

Derivative Rules

	Rule:	**Example:**
Exponential Derivatives:	Function: $f(x) = e^x$ Derivative: $f'(x) = e^x$	
	Function: $f(x) = e^u$ Derivative: $f'(x) = e^u \cdot u'$	Function: $f(x) = e^{4x^2-3}$ Derivative: $f'(x) = e^{4x^2-3}(8x)$ $= 8xe^{4x^2-3}$
	Function: $f(x) = b^u$ Derivative: $f'(x) = (lnb)b^u \cdot u'$	Function: $f(x) = 5^{2x-3}$ Derivative: $f'(x) = (ln5)5^{2x-3}(2)$ $= 2(ln5)5^{2x-3}$
Logarithm Derivatives:	Function: $f(x) = \ln(x)$ Derivative: $f'(x) = \frac{1}{x}$	
	Function: $f(x) = \ln(u)$ Derivative: $f'(x) = \frac{1}{u} \cdot u'$ $= \frac{u'}{u}$	Function: $f(x) = \ln(-3x^2 + 5x)$ Derivative: $f'(x) = \frac{1}{-3x^2 + 5x}(-6x + 5)$ $= \frac{-6x + 5}{-3x^2 + 5x}$
	Function: $f(x) = \log_b(u)$ Derivative: $f'(x) = \frac{1}{(lnb)u} \cdot u'$ $= \frac{u'}{(lnb)u}$	Function: $f(x) = \log_5(4x^3 - 1)$ Derivative: $f'(x) = \frac{1}{(ln5)(4x^3 - 1)} \cdot 12x^2$ $= \frac{12x^2}{ln5(4x^3 - 1)}$
Absolute Value Derivative:	Function: $f(x) = \lvert u \rvert$ Derivative: $f'(x) = \frac{u}{\lvert u \rvert} \cdot u'$	Function: $f(x) = \lvert 2x^3 \rvert$ Derivative: $f'(x) = \frac{2x^3}{\lvert 2x^3 \rvert} \cdot 6x^2$ $= \frac{2x^3}{2\lvert x^3 \rvert} \cdot 6x^2$ $= \frac{6x^5}{\lvert x^3 \rvert}$

Derivative Rules

	Rule:	**Example:**
Trig Derivatives:	Function: $f(x) = \sin x$ Derivative: $f'(x) = \cos x$	
	Function: $f(x) = \sin u$ Derivative: $f'(x) = (\cos u)u'$	Function: $f(x) = \sin(4x^2)$ Derivative: $f'(x) = \cos(4x^2) \cdot 8x$ $= 8x\cos(4x^2)$
	Function: $f(x) = \cos x$ Derivative: $f'(x) = -\sin x$	
	Function: $f(x) = \cos u$ Derivative: $f'(x) = -(\sin u)u'$	Function: $f(x) = \cos(x^3 - 4x)$ Derivative: $f'(x) = -(\sin(x^3 - 4x))(3x^2 - 4)$ $= -(3x^2 - 4)(\sin(x^3 - 4x))$
	Function: $f(x) = \tan x$ Derivative: $f'(x) = \sec^2 x$	
	Function: $f(x) = \tan u$ Derivative: $f'(x) = (\sec^2 u)u'$	Function: $f(x) = \tan(5x^2 + 1)$ Derivative: $f'(x) = (\sec^2(5x^2 + 1)) \cdot 10x$ $= 10x(\sec(5x^2 + 1))$
	Function: $f(x) = \cot x$ Derivative: $f'(x) = -\csc^2 x$	
	Function: $f(x) = \cot u$ Derivative: $f'(x) = -(\csc^2 u)u'$	Function: $f(x) = \cot(9x)$ Derivative: $f'(x) = -(\csc^2(9x)) \cdot 9$ $= -9\csc^2(9x)$
	Function: $f(x) = \sec x$ Derivative: $f'(x) = \sec x \tan x$	
	Function: $f(x) = \sec u$ Derivative: $f'(x) = (\sec u \tan u)u'$	Function: $f(x) = \sec(7x^2)$ Derivative: $f'(x) = (\sec(7x^2)\tan(7x^2)) \cdot 14x$ $= 14x(\sec(7x^2)\tan(7x^2))$
	Function: $f(x) = \csc x$ Derivative: $f'(x) = -\csc x \cot x$	
	Function: $f(x) = \csc u$ Derivative: $f'(x) = -(\csc u \cot u)u'$	Function: $f(x) = \csc(x^3)$ Derivative: $f'(x) = -(\csc(x^3)\cot(x^3)) \cdot 3x^2$ $= -3x^2(\csc(x^3)\cot(x^3))$

Derivative Rules

	Rule:	**Example:**
Inverse Trig Derivatives:	Function: $f(x) = \sin^{-1} x$ Derivative: $f'(x) = \dfrac{1}{\sqrt{1-x^2}}$	
	Function: $f(x) = \sin^{-1} u$ Derivative: $f'(x) = \dfrac{u'}{\sqrt{1-u^2}}$	Function: $f(x) = \sin^{-1}(5x^6)$ Derivative: $f'(x) = \dfrac{30x^5}{\sqrt{1-25x^{12}}}$
	Function: $f(x) = \cos^{-1} x$ Derivative: $f'(x) = -\dfrac{1}{\sqrt{1-x^2}}$	
	Function: $f(x) = \cos^{-1} u$ Derivative: $f'(x) = \dfrac{-u'}{\sqrt{1-u^2}}$	Function: $f(x) = \cos^{-1}(5x^6)$ Derivative: $f'(x) = \dfrac{-30x^5}{\sqrt{1-25x^{12}}}$
	Function: $f(x) = \tan^{-1} x$ Derivative: $f'(x) = \dfrac{1}{1+x^2}$	
	Function: $f(x) = \tan^{-1} u$ Derivative: $f'(x) = \dfrac{u'}{1+u^2}$	Function: $f(x) = \tan^{-1}(3x^2)$ Derivative: $f'(x) = \dfrac{6x}{1+9x^4}$
	Function: $f(x) = \cot^{-1} u$ Derivative: $f'(x) = \dfrac{-u'}{1+u^2}$	Function: $f(x) = \cot^{-1}(3x^2)$ Derivative: $f'(x) = \dfrac{-6x}{1+9x^4}$
	Function: $f(x) = \sec^{-1} u$ Derivative: $f'(x) = \dfrac{u'}{\lvert u\rvert\sqrt{u^2-1}}$	Function: $f(x) = \sec^{-1}(2x^4)$ Derivative: $f'(x) = \dfrac{8x^3}{\lvert 2x^4\rvert\sqrt{4x^8-1}}$ $= \dfrac{8x^3}{2x^4\sqrt{4x^8-1}}$ $= \dfrac{4}{x\sqrt{4x^8-1}}$
	Function: $f(x) = \csc^{-1} u$ Derivative: $f'(x) = \dfrac{-u'}{\lvert u\rvert\sqrt{u^2-1}}$	Function: $f(x) = \csc^{-1}(2x^4)$ Derivative: $f'(x) = \dfrac{-8x^3}{\lvert 2x^4\rvert\sqrt{4x^8-1}}$ $= \dfrac{-8x^3}{2x^4\sqrt{4x^8-1}}$ $= \dfrac{-4}{x\sqrt{4x^8-1}}$