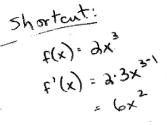
Derivative of a Function.notebook

The Derivative of a Function Recall $M = \lim_{h \to 0} \frac{f(a+h) - f(a)}{L}$ when it exists this limit is called the derivative of f at a. The derivative of the function f wr.t. the variable x is the forn f whose value is $f'(x) = \lim_{\Delta x \to 0} f(x + \Delta x - f(x))$ provided the limit exists Notations $y' f'(x) = \frac{dy}{dx} Dxy = \frac{df(x)}{dx}$

1

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ex. Find the derivative of the given for using the definition of the derivative $a) f(x) = ax^3$ $f'(x) = \lim_{\Delta x \to 0} \frac{f(x + \Delta x) - f(x)}{\Delta x}$ = $\lim_{\Delta x \to 0} \frac{2(x + \Delta x)^3 - 2x^3}{\Delta x}$ = $\lim_{\Delta x \to 0} (\frac{\partial x}{\partial x} + 2\Delta x)(x^2 + 2x\Delta x + \Delta x^2) - 2x^3$ = $\lim_{\Delta x \to 0} \frac{2x^3 + 6x^2 \Delta x + 6x \Delta x^2 + 2\Delta x^3 - 2x^3}{\Delta x}$ = $\lim_{\Delta x \to 0} \Delta x (6x^2 + 6x \Delta x + 2\Delta x^2)$ f'(x)= 6x2+ 6x(0) + 2(0) $f'(x) = 6x^{2}$



2

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b)
$$f(x) = 3x^{2}$$

 $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$
 $= \lim_{h \to 0} \frac{3(x^{2} + 3x^{h} + h^{s}) - 3x^{2}}{h}$
 $= \lim_{h \to 0} \frac{3(x^{2} + 3xh + h^{s}) - 3x^{2}}{h}$
 $= \lim_{h \to 0} \frac{3x^{2} + 6xh + 3h^{2} - 5x^{2}}{h}$
 $= \lim_{h \to 0} \frac{h(kx + 3h)}{h}$
 $= 6x + 3(0)$
 $= 6x$
Def'n of Derivative sheet
odds
The Power Rule
 $\frac{d}{dx} = n \cdot x^{n-1}$
 $y = x^{n}$
 $\frac{dy}{dx} = n \cdot x^{n-1}$

The Power Rule

$$xx.1 \quad \text{State the derivative of :}$$
a) 10 x 10 x¹⁻¹
10 1.10 x¹⁰ dx (10x) = 10
b) 6x³ - 4x² + 5x
18x³ - 8x + 5
c) 27 x⁰
d) y: $\frac{1}{x^3}$ 0 27 x⁰⁻¹
y': - 3x⁻⁴ or $-\frac{3}{x^4}$
c) $\frac{5x^3 + x^2}{x}$
 $\frac{(5x^2 + x)}{x}$ or $\frac{1}{x^4}$ or $\frac{1}{y^{10} \text{ ration}}$
 $f'(x) = -3x^4 - x + 5$
 $10x + 1$ $f'(x) = -12x^3 - 1$
 $\frac{1}{4x}(\frac{5x^2 + x^1}{x}) = 10x^{+1}$
Recall $yx = x^{\frac{1}{2}}$

4