Computing Derivatives

Math 130 - Essentials of Calculus

7 October 2019

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Computing Derivatives

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$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \to 0} \frac{c-c}{h} = \lim_{h \to 0} 0 = 0$$

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Property

$$\frac{d}{dx}[c]=0$$

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PROPERTY

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Property

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WORKING TOWARD AN EASIER PATH

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Property

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THEOREM (POWER RULE)

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EXAMPLE

Compute the derivative of the following functions:

• $f(x) = x^7$

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EXAMPLE

Compute the derivative of the following functions:

• $f(x) = x^7$ • $g(q) = \sqrt{q}$ • $f(x) = \frac{1}{x^3}$

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THEOREM (POWER RULE)

$$\frac{d}{dx}[x^n] = nx^{n-1}$$

EXAMPLE

Compute the derivative of the following functions:

f(x) = x⁷
g(q) =
$$\sqrt{q}$$
f(x) = $\frac{1}{x^3}$
h(t) = 19

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CONSTANT MULTIPLE RULE

Theorem

Let c be a real number,

$$\frac{d}{dx}[cf(x)]=cf'(x).$$

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Compute the derivative of the following functions:

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$$(q) = 3\sqrt{q}$$

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Let c be a real number,

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EXAMPLE

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 3 $f(x) = 9\sqrt[3]{x}$
 $g(q) = 3\sqrt{q}$
 9 $\sqrt[3]{x}$
 $w(z) = \frac{4}{z^3}$

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$$\frac{d}{dx}[f(x) + g(x)] = f'(x) + g'(x)$$
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EXAMPLE

Compute the derivative of the following functions:

 $f(x) = \frac{7}{4}x^2 - 3x + 12$

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Theorem

$$\frac{d}{dx}[f(x) + g(x)] = f'(x) + g'(x)$$
$$\frac{d}{dx}[f(x) - g(x)] = f'(x) - g'(x)$$

EXAMPLE

Compute the derivative of the following functions:

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$$f(x) = \frac{7}{4}x^2 - 3x + 12$$

2
$$g(x) = x^{5/3} - x^{2/3}$$

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$$f(x) = \frac{7}{4}x^2 - 3x + 12$$

$$g(x) = x^{5/3} - x^{2/3}$$

$$f(x) = x^5 - 2x^3 + x - 1$$

$$w(z) = 2x - 5x^{3/4}$$

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DEFINITION

e is the number such that

$$\lim_{h\to 0}\frac{e^h-1}{h}=1.$$

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Property

$$\frac{d}{dx}[e^x] = e^x$$

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