Math 103 Day 6: Derivative Rules

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Tuesday September 28, 2010

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Formula 1: When c is a constant

$$\frac{d}{dx}(c) = 0$$

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Formula 2:

$$\frac{d}{dx}(x) = 1$$

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Formula 3: When *n* is a positive integer,

$$\frac{d}{dx}(x^n) = nx^{n-1}$$

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$$\frac{d}{dx}(x^n) = nx^{n-1}$$

fact:
$$(x - a)^n = (x - a)(x^{n-1} + ax^{n-2} + a^2x^{n-3} + \dots + a^{n-2}x + a^{n-1})$$

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Formula 4:(General Power Rule) When n is any real number,

$$\frac{d}{dx}(x^n) = nx^{n-1}$$

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Formula 5: If c is a constant and f is differentiable, then

$$\frac{d}{dx}(cf(x)) = c\frac{d}{dx}(f(x))$$

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Formula 6: (Sum Rule) If g and f are differentiable, then

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

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Formula 7: (Difference Rule) If g and f are differentiable, then

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

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Formula 8:(Product Rule) If f and g are both differentiable, then

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

Formula 9:(Quotient Rule) If f and g are differentiable, then

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)\frac{d}{dx}(f(x)) - f(x)\frac{d}{dx}(g(x))}{(g(x))^2}$$

Theorem

If f(x) = sin(x), then f'(x) = cos(x).

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Theorem

If
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This is challenging to prove, so we need some lemmas.

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Theorem

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Lemma

$$lim_{ heta
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Lemma

$$lim_{\theta \to 0} \frac{(cos(\theta) - 1)}{\theta} = 0$$

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