Day 15 is Monday, February 18, 2013

One more example involving the Derivative of an Exponential Function

Let $f(x) = 11e^{(x)} + 23x$

Find the equation of the line that is tangent to the graph of $f(x)$ at $x=0$.

Solution

We need to build the tangent line equation

$$(y - f(a)) = f'(a)\cdot(x-a)$$

Get Parts

$a=0$ (this is the x-coordinate of the point of tangency)

$$f(a) = f(0) = 11e^{(0)} + 23(0) = 11\cdot(1) + 0 = 11$$

(this is the y-coordinate of the point of tangency)

$$f'(x) = \frac{d}{dx}\left(11e^{(x)} + 23x\right)$$

$$= 11\frac{d}{dx}e^{(x)} + 23\frac{d}{dx}x$$

$$= 11(e^{x}) + 23(1)$$

$$= 11e^{x} + 23$$

$$f'(a) = f'(0) = 11 \cdot e^{(0)} + 23 = 11(1) + 23 = 34$$

(this is the slope m of the tangent line)

Substitute Parts into the Equation

$$(y - 11) = 34(x - 0)$$

Convert to Slope Intercept form

$$y - 11 = 34x$$

$$\boxed{y = 34x + 11}$$ Tangent line equation

Derivatives of Logarithmic Functions

Two New Derivative Rules

Logarithmic Function Rule #1

If $f(x) = \ln(x)$ then $f'(x) = \frac{1}{x}$ two equation form

$$\frac{d}{dx}\ln(x) = \frac{1}{x}$$ single equation form

Logarithmic function Rule #2

If $f(x) = \log_b(x)$ then $f'(x) = \frac{1}{x \cdot \ln(b)}$ two equation form

$$\frac{d}{dx}\log_b(x) = \frac{1}{x\ln(b)}$$ single equation form