11/6

$$\frac{d}{dx} 2^x = \left(e^{\ln 2}\right)^x = e^{x \cdot \ln 2}$$

$(\ln 2)x$

$$\frac{d}{dx} e^{(x \cdot \ln 2)} = e^{x(\ln 2)} \cdot \ln(2) = 2^x \cdot \ln 2$$

$.693\ldots$

$$\frac{d}{dx} e^{(x^2)} = e^{x^2} \cdot 2x$$

$$\frac{d}{dx} a^x : \lim_{h \to 0} \left(\frac{a^{x+h} - a^x}{h} = \frac{a^x a^h - a^x}{h} = \frac{a^x (a^h - 1)}{h} \right.$$

$$= a^x \left(\lim_{h \to 0} \frac{a^h - a^0}{h} \right)$$

$\ln(2)$

$\frac{d}{dx} a^x$ at $x = 0$

$$2^x = e^{x(\ln 2)}$$

$$a^x = e^{x \cdot \ln a}$$

"$(e^{\ln a})^x$"

$$P(t) = P_0 e^{kt}$$

$$P'(t) = P_0 e^{kt} \cdot k = k P(t)$$

Instantaneous rate of change is $k \cdot$ current value

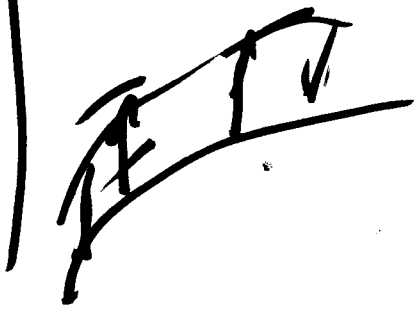
$f(x) = \ln(x)$ $f'(x) = x^{-1} = \frac{1}{x}$

$f(x) = \ln(x^2)$ $f'(x) = \frac{1}{x^2} \cdot 2x = 2 \cdot \frac{1}{x}$

$2\ln(x)$ $\Rightarrow f'(x) = 2 \cdot \frac{1}{x} = \frac{2}{x}$

$f(x) = \ln(5x)$ $f'(x) = \frac{1}{5x} \cdot 5 = \frac{1}{x}$

$\ln(x) + \ln(5)$ $f'(x) = \frac{1}{x} + 0$



$f(x) = x^x$

$f(2) = 4 = 2^2$

$f(3) = 27 = 3^3$

$f(4) = = 256$

$f'(x) =$

$f(x) = (e^{\ln x})^x = e^{x \cdot \ln(x)}$

$f'(x) = e^{x \ln x} \cdot \left[1 \cdot \ln(x) + x \cdot \frac{1}{x} \right]$

$= x^x [\ln x + 1]$

$$g(x) = \ln(f(x))$$

$$g'(x) = \frac{1}{f(x)} \cdot f'(x) = \frac{f'(x)}{f(x)}$$

$$f'(x) = f(x) \cdot g'(x)$$

$$= f(x) \cdot \frac{d}{dx} \ln(f(x))$$

$$f(x) = x^x$$

$$f'(x) = x^x \cdot \frac{d}{dx} [x \ln x]$$

$$f(x) = \frac{(x^2+3x)^5\left(\sqrt{x+3}\right)^6}{\left(x+\frac{1}{x}\right)^2(x-3)^{1/2}}$$

quo/pro Rom Yuck

$$f'(x) = f(x)\cdot(\ln f(x))'$$

$$f'(x) = \frac{(x^2+3x)^5\left(\sqrt{x+3}\right)^6}{\left(x+\frac{1}{x}\right)^2(x-3)^{1/2}}\left[\frac{5\cdot 2x}{x^2+3x}+\frac{3}{x+3}-2\frac{\left(1-\frac{1}{x^2}\right)}{x+\frac{1}{x}}-\frac{1}{2}\frac{1}{x-3}\right]$$

$$\ln f(x) = 5\ln(x^2+3x)+3\ln(x+3)-2\ln\left(x+\frac{1}{x}\right)-\frac{1}{2}\ln(x-3)$$