AP Calculus AB
Wednesday, April 23, 2014

$$\lim_{h\to 0} \frac{\ln(4+h) - \ln 4}{h} \rightarrow \text{Asking for } f'(4) \text{ if } f(x) = \ln x.$$

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

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

$f(x) = \sqrt{x^2-4}$ $\quad g(x) = 3x-2$

Derivative $f(g(x))$ @ $x = 3$ ?

$$\boxed{f'(g(x)) \cdot g'(x)}$$

$$f'(g(3)) \cdot g'(3)$$

$g(3) = 7$

$g'(x) = 3$

$g'(3) = 3$

$f'(7) = ?$

$$f(x) = (x^2-4)^{1/2}$$

$$f'(x) = \frac{1}{2}(x^2-4)^{-1/2} \cdot 2x$$

$$f'(7) = \frac{7}{\sqrt{45}}$$

$$\frac{7}{\sqrt{45}} \cdot \frac{3}{1} = \frac{21}{\sqrt{45}} = \frac{21}{3\sqrt{5}} = \frac{7}{\sqrt{5}}$$

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

$f'(x) = 3(2x+1)^2 \cdot 2$

$f'(0) = 3 \cdot 1^2 \cdot 2$

$f'(0) = 6$

$$f(g(x)) = x$$

$$f'(g(x)) \cdot g'(x) = 1$$

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

$f(0) = 1$

$g(1) = 0$

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

$$g'(1) = \frac{1}{f'(0)}$$

$$g'(1) = \frac{1}{6}$$

$$\lim_{x\to\infty} \frac{3x^2-1}{x^2+30x} = \frac{3}{1}$$

$\lim_{x\to\infty} \frac{P(x)}{Q(x)}$ where $P(x)$ & $Q(x)$ are polynomials $\rightarrow$

If degree of $P(x) <$ degree of $Q(x)$, then $\lim_{x\to\infty} \frac{P(x)}{Q(x)} = 0$.

If deg of $P(x) >$ deg of $Q(x)$, then lim dne.

If deg of $P(x) =$ deg of $Q(x)$, then

$\lim_{x\to\infty} \frac{P(x)}{Q(x)} =$ Ratio of LEADING coefficients

p. 63 in text

$$\lim_{x\to 0} \frac{\sin x}{x} = 1$$

$$\lim_{x\to 0} \frac{\frac{5}{2}(\sin 5x)}{2x \cdot \frac{5}{2}} =$$

$$2x \cdot \boxed{\tfrac{5}{2}} = 5x$$

$$\lim_{x\to 0} \frac{1-\cos x}{x} = 0$$

$$\lim_{x\to 0} \frac{\frac{5}{2} \cdot \sin 5x}{5x}$$

$$\frac{5}{2} \cdot \boxed{\lim_{x\to 0} \frac{\sin 5x}{5x}} = 1$$

$\int x(4^{(-x^2)})\,dx =$

$\frac{d}{dx}[e^u] = u' \cdot e^u$

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

$\frac{d}{dx}\, 4^x = 4^x \cdot \ln 4$

$\int a^x \cdot \ln a\, dx = a^x + C \leftarrow \frac{d}{dx}[a^x] = a^x \cdot \ln a$

$a > 0$ ; $a \neq 1$

$\int x(4^{(-x^2)})\,dx =$

Let $u = -x^2$

$du = -2\boxed{x\,dx}$

$-\frac{1}{2} du = x\,dx$

$\int -\frac{1}{2} du \cdot 4^u$

$-\frac{1}{2} \int 4^u du \cdot \frac{\ln 4}{\ln 4}$

$\frac{-1}{2\ln 4} \underbrace{\int 4^u \cdot \ln 4\, du}$

$\frac{-1}{2\ln 4} \cdot 4^u + C$

$\frac{-1}{2\ln 4} \cdot 4^{-x^2} + C$ !

Redo $\int x e^{-x^2} dx$

p. 165 Be Prepared : 1-21 → check answers!

↓SUBMIT on 4-24