PHYSICS PHOR PHUN
TEMPLETON, CA

Calculus

MATH AND SCIENCE TUTORING
805-610-1725

Basic derivatives and integrals

	use when...	derivatives	integrals
definition	slope of a line	$\frac{d}{dx}f(x)=\lim\limits_{h\to 0}\frac{f(x+h)-f(x)}{h}$	$\frac{d}{dx}\int f(x)\,dx=f(x)+C$
power rule	powers of a variable	$\frac{d}{dx}x^n=nx^{n-1}$	$\int f(x)\,dx=\frac{1}{n+1}x^{n+1}+C$
constants	not a function of the variable	$\frac{d}{dx}c=0$	$\int c\,dx=cx+C$
	constant multiple of a function	$\frac{d}{dx}cf(x)=c\frac{d}{dx}f(x)$	$\int cf(x)\,dx=c\int f(x)\,dx$
identity	function of one	$\frac{d}{dx}x=1$	$\int n\,dx=nx+C$
addition/ subtraction	two functions added or subtracted	$\frac{d}{dx}[f(x)\pm g(x)]=\frac{d}{dx}f(x)\pm\frac{d}{dx}g(x)$	$\int[f(x)\pm g(x)]\,dx=\int f(x)\,dx\pm\int g(x)\,dx$
product	two functions multiplied	$\frac{d}{dx}f(x)g(x)=g(x)\frac{d}{dx}f(x)+f(x)\frac{d}{dx}g(x)$	-
quotient	division of two functions	$\frac{d}{dx}\frac{f(x)}{g(x)}=\frac{g(x)\frac{d}{dx}f(x)-f(x)\frac{d}{dx}g(x)}{[g(x)]^2}$	-
reciprocal	reciprocal of a function	$\frac{d}{dx}\frac{1}{g(x)}=-\frac{\frac{d}{dx}g(x)}{[g(x)]^2}$	$\int\frac{1}{u}du=\ln\lvert u\rvert+C$
chain rule	a function of a function is being differentiated	$\frac{d}{dx}f(u(x))=\frac{d}{du}f(u)\frac{d}{dx}u(x)$	-
substitution	a function and its derivative are in an expression	-	$\int\left[f(u)\frac{du}{dx}\right]dx=\int f(u)\,du$
implicit	y is hard to solve for	$\frac{d}{dx}f(y)=\frac{d}{dy}f(y)\frac{dy}{dx}$	-
definite	integral of an interval	-	$\int_a^b f(x)dx=F(b)-F(a)$
exponential	e^x	$\frac{d}{dx}e^x=e^x$	$\int e^x dx=e^x+C$
	b^x	$\frac{d}{dx}b^x=b^x\ln b$	$\int b^x\,dx=\frac{b^x}{\ln b}+C$
	e^u	$\frac{d}{dx}e^u=e^u\frac{du}{dx}$	$\int e^u\,du=e^u+C$
	b^u	$\frac{d}{dx}b^u=b^u\ln b\frac{du}{dx}$	$\int b^u du=\frac{b^u}{\ln b}+C$
logarithmic	when variable is in an exponent	$\ln y=\ln b^x$	
	ln x	$\frac{d}{dx}\ln x=\frac{1}{x},\ x>0;\quad\frac{d}{dx}\ln\lvert x\rvert=\frac{1}{x},\ x\neq 0$	$\int\frac{1}{x}dx=\ln\lvert x\rvert+C$
	ln u	$\frac{d}{dx}\ln u=\frac{1}{u}\frac{du}{dx}$	$\int\frac{1}{u}du=\ln\lvert u\rvert+C$
	$\log_b x$	$\frac{d}{dx}\log_b x=\frac{1}{x\ln b}$	$\int\frac{1}{x\ln b}dx=\log_b x+C$
	$\log_b u$	$\frac{d}{dx}\log_b u=\frac{1}{u\ln b}\frac{du}{dx}$	-