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Calculus:

Expression Type	Form	First Derivative	Related Integral
Constant	c	$\frac{dy}{dx}=0$	$\int c\,dx = cx + C$
Polynomial	$y=x^n$	$\frac{dy}{dx}=nx^{n-1}$	$\int x^n dx = \frac{x^{n+1}}{n+1}+C$
Power of a Functions	$y=u^n$	$\frac{dy}{dx}=\frac{du}{dx}nu^{n-1}$	$\int u^n du = \frac{u^{n+1}}{n+1}+C$ n≠1
Log	$y=\ln u$	$\frac{dy}{dx}=\frac{1}{u}\frac{du}{dx}$	$\int u^{-1}du=\int\frac{du}{u}=\ln\lvert u\rvert+C$
Sin(u)	$y=\sin u$	$\frac{dy}{dx}=\frac{du}{dx}\cos u$	$\int \cos u\,du=\sin u+C$
Cos(u)	$y=\cos u$	$\frac{dy}{dx}=-\frac{du}{dx}\sin u$	$\int \sin u\,du=-\cos u+C$
Exponent	$y=e^u$	$\frac{dy}{dx}=\frac{du}{dx}e^u$	$\int e^u du=e^u+C$
Product of Constant and Function	$y=cu$	$\frac{dy}{dx}=c\frac{du}{dx}$	$\int cf(u)du=c\int f(u)du$
Sum of two functions	$y=u+v$	$\frac{dy}{dx}=\frac{du}{dx}+\frac{dv}{dx}$	$\int\{f(u)+g(u)\}du=$ $\int f(u)du+\int g(u)du$
Product of two functions	$y=uv$	$\frac{dy}{dx}=u\frac{dv}{dx}+v\frac{du}{dx}$	$\int u\,dv=uv-\int v\,du$ Integration by parts
Quotient of two Functions	$y=\frac{u}{v}$	$\frac{dy}{dx}=\frac{v\frac{du}{dx}-u\frac{dv}{dx}}{v^2}$	
Chain Rule	$y=f(u(x))$	$\frac{dy}{dx}=\frac{dy}{du}\frac{du}{dx}$	$\int f(u(x))\left(\frac{du}{dx}\right)dx=\int f(u)du$

Partial fractions – there are three types (equate numerators then pick values of *s* to find *A, B, C*):

Type	Form
Product of simple linear factors	$\frac{7s-1}{(s+1)(s-3)}=\frac{A}{s+1}+\frac{B}{s-3};\quad 7s-1=A(s-3)+B(s+1)$
Repeated linear factor	$\frac{7s-1}{(s+1)^2(s-3)}=\frac{A}{s-3}+\frac{B}{s+1}+\frac{C}{(s+1)^2}$
Quadratic factor	$\frac{7s-1}{(s^2+1)(s-3)}=\frac{As+B}{s^2+1}+\frac{C}{s-3}$

Completing the square

Problem: transform a quadratic as follows: $Ax^2 + Bx + C = A\left\{(x+a)^2 + b^2\right\}$

Solution:

1) Expand the right hand side: $Ax^2 + Bx + C = A\left\{x^2 + 2ax + a^2 + b^2\right\}$
2) Match coefficient of x to find a: $B = 2Aa$ so $a = \dfrac{B}{2A}$
3) The constant is b^2 $C = A\left\{a^2 + b^2\right\}$ so $b^2 = \dfrac{C}{A} - a^2$

Properties of Logarithms and Exponents $v = \log_b u$ $u = b^v$

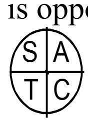
Name	Exponents	Logs
Product Rule	$b^u b^v = b^{u+v}$	$\log_b u + \log_b v = \log_b uv$
Division Rule	$\dfrac{b^u}{b^v} = b^{u-v}$ $\left(b^{-v} = \dfrac{1}{b^v}\right)$	$\log_b u - \log_b v = \log_b \dfrac{u}{v}$
Power Rule	$\left(b^u\right)^v = b^{uv}$	$\log_b u^v = v \log_b u$
Unity	$b^0 = 1$	$\log_b 1 = 0$
Identity	$u = b^{\log_b u}$	$\log_b b = 1$
Equality: $u = v$ $b^u = b^v$ $\log_b u = \log_b v$		Base Conversion: $\log_b u = \dfrac{\log_a u}{\log_a b}$

Trig

SOHCAHTOA: $\sin u = \dfrac{opp}{hyp}$ $\cos u = \dfrac{adj}{hyp}$ $\tan u = \dfrac{opp}{adj} = \dfrac{\sin u}{\cos u}$

Law of sines $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$ (side a is opposite angle A, etc.)

Law of cosines $a^2 = b^2 + c^2 - 2bc\cos A$ (side a is opposite angle A)

$\cos^2 A + \sin^2 A = 1$ *A*ll *S*tudents *T*ake *C*alculus: 

(positive trig functions)

$\sin(\alpha + \beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$ $\cos(\alpha + \beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$

Caveat: When using inverse trig functions, beware - the calculator returns only one of the possible two answers – you need to figure out the other one.

$a\cos\omega t + b\sin\omega t = A\sin(\omega t + \varphi)$ with $A = \sqrt{a^2 + b^2}$ $\tan\phi = a/b$

Other

Arc length: $s = r\theta$ Sector area: $A = \dfrac{1}{2}r^2\theta$

$ax + ay = a(x+y)$ $x^2 - y^2 = (x+y)(x-y)$ $x^2 \pm 2xy + y^2 = (x \pm y)^2$

FOIL (*F*irst, *O*uter, *I*nner, *L*ast) = how to multiply two binomials
PEMDAS (*P*arentheses, *E*xponents, *M*ultiply, *D*ivide, *A*dd, *S*ubtract) = order of operations

Quadratic equation: $ax^2 + bx + c = 0$ solution: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$