Integration	
Basic Integration Rules Integration is the "inverse" of differentiation, and vice versa.	$\int f'(x)\,dx = f(x) + C$ $\frac{d}{dx}\int f(x)\,dx = f(x)$
$f(x) = 0$	$\int 0\,dx = C$
$f(x) = k = kx^0$	$\int k\,dx = kx + C$
1. The Constant Multiple Rule	$\int k\,f(x)\,dx = k\int f(x)\,dx$
2. The Sum and Difference Rule	$\int [f(x) \pm g(x)]\,dx = \int f(x)\,dx \pm \int g(x)\,dx$
The Power Rule $f(x) = kx^n$	$\int x^n\,dx = \frac{x^{n+1}}{n+1} + C,$ where $n \neq -1$ $If\ n = -1,$ then $\int x^{-1}\,dx = \ln\lvert x\rvert + C$
The General Power Rule	If $u = g(x)$, and $u' = \frac{d}{dx}g(x)$ then $\int u^n\,u'dx = \frac{u^{n+1}}{n+1} + C, where\ n \neq -1$

Integration	
Swap Bounds	$\int_a^b f(x)\,dx = -\int_b^a f(x)\,dx$

Integration	
Additive Interval Property	$\int_a^b f(x)\,dx = \int_a^c f(x)\,dx + \int_c^b f(x)\,dx$

1. $\int a\,dx = ax + C$

2. $\int x^n\,dx = \frac{x^{n+1}}{n+1} + C, \quad n \neq -1$

3. $\int \frac{1}{x}\,dx = \ln|x| + C$

4. $\int e^x\,dx = e^x + C$

5. $\int a^x\,dx = \frac{a^x}{\ln a} + C$

6. $\int \ln x\,dx = x\ln x - x + C$

7. $\int \sin x\,dx = -\cos x + C$

8. $\int \cos x\,dx = \sin x + C$

9. $\int \tan x\,dx = \ln|\sec x| + C$ or $-\ln|\cos x| + C$

10. $\int \cot x\,dx = \ln|\sin x| + C$

11. $\int \sec x\,dx = \ln|\sec x + \tan x| + C$

12. $\int \csc x\,dx = \ln|\csc x - \cot x| + C$

13. $\int \sec^2 x\,dx = \tan x + C$

14. $\int \sec x \tan x\,dx = \sec x + C$

15. $\int \csc^2 x\,dx = -\cot x + C$

16. $\int \csc x \cot x\,dx = -\csc x + C$

17. $\int \tan^2 x\,dx = \tan x - x + C$

18. $\int \frac{dx}{a^2 + x^2} = \frac{1}{a} Arc\tan\left(\frac{x}{a}\right) + C$

19. $\int \frac{dx}{\sqrt{a^2 - x^2}} = Arc\sin\left(\frac{x}{a}\right) + C$

20. $\int \frac{dx}{x\sqrt{x^2 - a^2}} = \frac{1}{a} Arc\sec\frac{|x|}{a} + C$

$$= \frac{1}{a} Arc\cos\left|\frac{a}{x}\right| + C$$

Properties of Integrals:

$\int kf(u)du = k\int f(u)du$	$\int [f(u) \pm g(u)]du = \int f(u)du \pm \int g(u)du$
$\int_a^a f(x)dx = 0$	$\int_a^b f(x)dx = -\int_b^a f(x)dx$
$\int_a^c f(x)dx = \int_a^b f(x)dx + \int_b^c f(x)dx$	$f_{ave} = \frac{1}{b-a}\int_a^b f(x)dx$
$\int_{-a}^{a} f(x)dx = 2\int_0^a f(x)dx$ if f(x) is even	$\int_{-a}^{a} f(x)dx = 0$ if f(x) is odd
$\int_a^b g(f(x))f'(x)dx = \int_{f(a)}^{f(b)} g(u)du$	$\int udv = uv - \int vdu$

Integration Rules:

$\int du = u + C$ $\int u^n du = \frac{u^{n+1}}{n+1} + C$ $\int \frac{du}{u} = \ln\|u\| + C$ $\int e^u du = e^u + C$ $\int a^u du = \frac{1}{\ln a}a^u + C$	$\int \sin u\ du = -\cos u + C$ $\int \cos u\ du = \sin u + C$ $\int \sec^2 u\ du = \tan u + C$ $\int \csc^2 u = -\cot u + C$ $\int \csc u \cot u\ du = -\csc u + C$ $\int \sec u \tan u\ du = \sec u + C$	$\int \frac{du}{a^2+u^2} = \frac{1}{a}\arctan\left(\frac{u}{a}\right) + C$ $\int \frac{du}{\sqrt{a^2-u^2}} = \arcsin\left(\frac{u}{a}\right) + C$ $\int \frac{du}{u\sqrt{u^2-a^2}} = \frac{1}{a}arc\sec\left(\frac{\|u\|}{a}\right) + C$