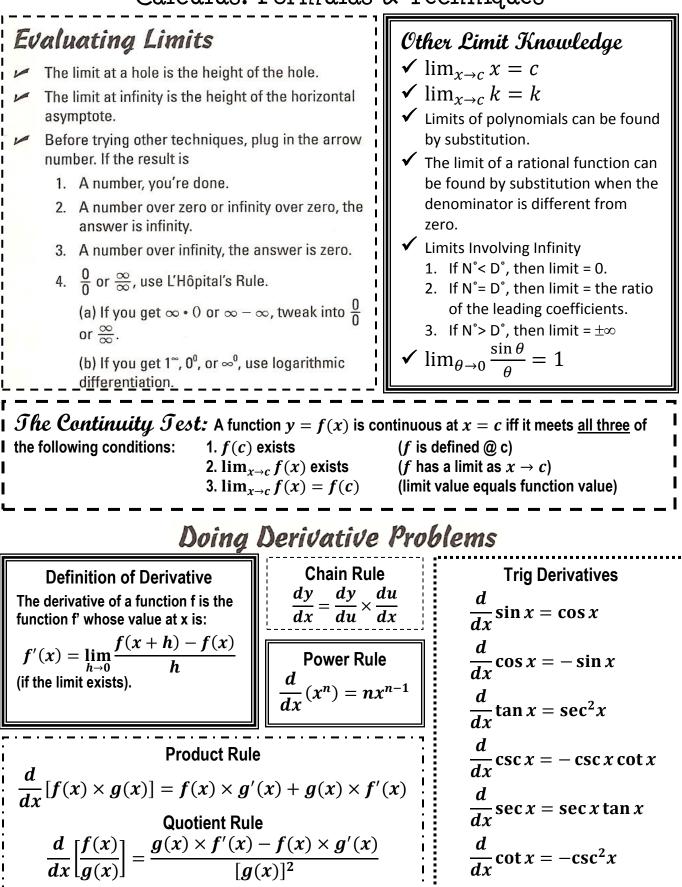
Calculus: Formulas & Techniques



Implicit Differentiation

- 1. Differentiate both sides of the equation with respect to x.
- 2. Collect the terms with *dy/dx* on one side of the equation.
- 3. Factor out *dy/dx*.

value of C.

4. Solve for *dy/dx* by dividing.

General Antiderivatives $x^{n} = \frac{x^{n+1}}{n+1} + C$ $\sin x = -\frac{\cos(kx)}{k} + C$ $\cos x = \frac{\sin(kx)}{k} + C$ Differential Equations & Initial Value Problems
1. Find the general antiderivative of *f*.
2. Use the initial condition to find the

y = F(x) + C

Basic Integral Rules

$$\int 0 \, dx = C$$

$$\int k \, dx = kx + C$$

$$\int k f(x) dx = k \int f(x) \, dx$$

$$\int [f(x) \pm g(x)] dx =$$

$$\int f(x) \, dx \pm \int g(x) dx$$

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

Fundamental Theorem of Calculus If *f* is continuous on every point [a, b] and *F* is any antiderivative of *f* on [a, b], then:

$$\int_{a}^{b} f(x)dx = F(b) - F(a)$$

Techniques of Integration

Guess and Check: Works when integrand is close to a simple backward derivative.

Trig Integrals

- 1. Use Pythagorean identities.
 - (1) $\sin^2 x + \cos^2 x = 1$
 - (2) $\tan^2 x + 1 = \sec^2 x$

(3)
$$1 + \cot^2 x = \csc^2 x$$

(1)
$$\sin^2\theta = \frac{1}{2}(1 - \cos 2\theta)$$

(2)
$$\cos^2\theta = \frac{1}{2}(1 + \cos 2\theta)$$

Integral Rules of Trig Functions

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

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

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

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

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

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

 $\frac{\#}{x^n} = \#x^{-n} \qquad \stackrel{\text{Algebra Tricks}}{\sqrt[n]{x^m}} = x^{m/n}$