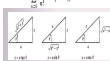


If $\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = \frac{0}{0}$
or
 $\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = \frac{\infty}{\infty}$

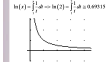
Then $\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = \lim_{x \rightarrow a} \frac{f'(x)}{g'(x)}$

provided that the latter limit exists.

$f(x) = f(a) + f'(a)(x-a) + \frac{f''(a)}{2!}(x-a)^2 + \dots$
 $g(x) = g(a) + g'(a)(x-a) + \frac{g''(a)}{2!}(x-a)^2 + \dots$



$u(x) = \sum_{k=0}^{\infty} u_k(x) = \sum_{k=0}^{\infty} [u_k(x) + v_k(x)]$



$\int u dx = uv - \int v du$

By parts: $\int u dx = uv - \int v du$
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Basic Integration Rules

$f(x)$	$\int f(x) dx$
x^n	$\frac{x^{n+1}}{n+1} + c$
$\frac{1}{x}$	$\ln x + c$
$\frac{f'(x)}{f(x)}$	$\ln f(x) + c$

Basic Integration Rules: Substitution

u-substitution for Integration

Let g be a differentiable function and suppose F is an antiderivative of f .

If $u = g(x)$, then $\int f(g(x))g'(x)dx = \int f(u)du = F(u) + c = F(g(x)) + c$.

EX 1 $\int \frac{3x}{\sin^2(4x^2)} dx$

EX 2 $\int \frac{5e^{3x^2}}{x^2} dx$

EX 3 $\int \frac{5}{9+(2x-1)^2} dx$

EX 4 $\int \frac{3x^2 - 4x + 2}{x-2} dx$

EX 5 $\int \frac{2x}{\sqrt{1-x^2}} dx$

EX 6 $\int \frac{\sin(\ln(4x^2))}{x} dx$