Derivative of the natural logarithm:

Use the derivative definition:

$$\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$$

and apply it to the function: $f(x)=\ln(x)$

$$\lim_{h\to 0}\frac{\underline{\qquad\qquad\qquad\qquad}}{h}=\lim_{h\to 0}\frac{\ln\left(\frac{\qquad\qquad}{}\right)}{h}=\lim_{h\to 0}\frac{1}{h}\cdot\ln\left(\underline{\qquad\qquad}\right)=$$

here write the formula here combine the logs here write 1/h as a factor.

$$\lim_{h\to 0}\ \ln\left(\left(\underline{\qquad\qquad}\right)\quad\right)=\lim_{h\to 0}\ \ln\left(\left(\underline{\quad}+\underline{\quad}\right)\qquad\right)=\lim_{h\to 0}\ \ln\left(\left(\qquad+\underline{\quad}\right)\qquad\right)$$

use the product→exponent rule turn into 2 fractions simplify x/x

Now, we're going to make a substitution: $\frac{h}{x}=k$

Solve and figure out: $\frac{1}{h}=\underline{\qquad}$ when $h\to 0$ (and $x\neq 0$) figure out $k\to$

$$=\lim_{k\to}\ \ln\left(\left(1+\qquad\right)\qquad\right)=\lim_{k\to}\ \ln\left(\left(1+\qquad\right)^{\frac{1}{k}\cdot}\qquad\right)=\ln\left(\left(\qquad\right)\quad\right)$$

Make the substitution Separate the x from the k: Use $e=\lim_{k\to 0}(1+k)^{1/k}$

$=$

Simplify

So the derivative of the natural logarithm is:

$$\frac{d}{dx}\ln x=$$

Which means $\int \qquad dx=\ln x+C$