Title

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$$
\begin{aligned}
-x^{-2} \neq \int x^{-1} = \int \frac{1}{x} = \ln x \\
\frac{1}{x} \neq \int \ln x = x \ln x - x \\
\int x^{-k} = \frac{1}{-k+1} x^{-k+1} \neq \frac{1}{-(k+1)} x^{-(k+1)} \\
\text{e.g. } \int x^{-2} = -x^{-1} \neq -\frac{1}{3} x^{-3} \lim_{n\to\infty} \frac{n}{n+1} = 1 \neq 0 \\
\frac{\partial}{\partial x} a^x = \frac{\partial}{\partial x} e^{x \ln a} = e^{x \ln a} \ln a = a^x \ln a.
\end{aligned}
$$

Exponentials: when in doubt, write $a^b = e^{b \ln a}$

$$\frac{\partial}{\partial x} x^{f(x)} = ?$$

$$\sum x^k = \frac{1}{1-x} \neq \frac{1}{1+x} = \sum (-1)^k x^k$$

$\frac{\partial f}{\partial x} \Leftarrow$	f	$\Rightarrow \int f dx$
$\frac{1}{2\sqrt{x}}$	$\sqrt{x}$	$\frac{2}{3}x^{\frac{3}{2}}$
nx^{n-1}	$x^n, n \neq -1$	$\frac{1}{n+1}x^{n+1}$
$\frac{1}{x}$	$\ln(x)$	$x\ln(x) - x$
$a^x \ln(a)$	a^x	$\frac{a^x}{\ln a}$
$\cos(x)$	$\sin(x)$	$-\cos(x)$
$-\sin(x)$	$\cos(x)$	$\sin(x)$
$2\sec^2(x)\tan(x)$	$\sec^2(x)$	$\tan(x)$
$2\csc^2(x)\cot(x)$	$\csc^2(x)$	$-\cot(x)$
$\sec^2(x)$	$\tan(x)$	$\ln\lvert\sec(x)\rvert$
$\sec(x)\tan(x)$	$\sec(x)$	$\ln\lvert\sec(x) + \tan(x)\rvert$
$-\csc(x)\cot(x)$	$\csc(x)$	$\ln\lvert\csc(x) - \cot(x)\rvert$
$\frac{1}{1+x^2}$	$\tan^{-1}(x)$	$x\tan^{-1}x - \frac{1}{2}\ln(1+x^2)$
$\frac{1}{\sqrt{1-x^2}}$	$\sin^{-1}(x)$	$x\sin^{-1}x + \sqrt{1-x^2}$
$-\frac{1}{\sqrt{1-x^2}}$	$\cos^{-1}(x)$	$x\cos^{-1}x - \sqrt{1-x^2}$
$\frac{1}{\sqrt{x^2+a}}$	$\ln\left\lvert x + \sqrt{x^2+a}\right\rvert$	.
$-\csc^2(x)$	$\cot(x)$	?
?	$\cos^2(x)$	?
?	$\sin^2(x)$	?
?	xe^{ax}	$\frac{1}{a^2}(ax-1)e^{ax}$
?	$e^{ax}\sin(bx)$	$\frac{1}{a^2+b^2}e^{ax}(a\sin bx - b\cos bx)$
?	$e^{ax}\cos(bx)$	$\frac{1}{a^2+b^2}e^{ax}(a\sin bx + b\cos bx)$
?	?	?

$\sqrt{a^2-x^2}$	$\Rightarrow$	$x = a\sin(\theta)$	$dx = a\cos(\theta)\ d\theta$
$\sqrt{a^2+x^2}$	$\Rightarrow$	$x = a\tan(\theta)$	$dx = a\sec^2(\theta)\ d\theta$
$\sqrt{x^2-a^2}$	$\Rightarrow$	$x = a\sec(\theta)$	$dx = a\sec(\theta)\tan(\theta)\ d\theta$