Face-to-Face with an Indefinite Integral

methods	examples
1.) formula	$\int e^x\,dx = e^x + c$
	$\int \frac{1}{x}\,dx = \ln\lvert x\rvert + c$
2.) algebra	$\int \tan x\,dx = \ln\lvert\sec x\rvert + c$
a.) separate fraction	$\int \frac{x^3+1}{x^2}\,dx$
b.) +, − same term	$\int \frac{x}{x+1}\,dx$
c.) square term	$\int x\,(x^3+1)^2\,dx$
d.) polynomial division	$\int \frac{x^3}{x+1}\,dx$
3.) chain rule backwards	$\int x^2 e^{x^3}\,dx$
	$\int \sec^2 x\,(1+\tan x)^5\,dx$
4.) u-substitution	
a.) standard	$\int x^2 e^{x^3}\,dx$, $\int \frac{e^x}{1+e^x}\,dx$
b.) u-sub., solve for x	$\int (x+1)\sqrt{x+2}\,dx$
c.) obscure u-sub.	$\int \frac{\sqrt{x}}{1+\sqrt{x}}\,dx$
5.) integration by parts:	$\int u\,dv = uv - \int v\,du$
a.) standard	$\int xe^x\,dx$, $\int \ln x\,dx$
b.) more than once	$\int x^2 \sin x\,dx$
c.) obscure	$\int \frac{x^3 e^{x^2}}{(x^2+1)^2}\,dx$
6.) partial fractions	
a.) standard	$\int \frac{1}{x^2-4}\,dx = \int\left[\frac{\frac{1}{4}}{x-2} + \frac{\frac{-1}{4}}{x+2}\right]dx$
b.) repeated factors	$\int \frac{1}{x^3-x^2}\,dx = \int\left[\frac{-1}{x} + \frac{-1}{x^2} + \frac{1}{x-1}\right]dx$
c.) divide first	$\int \frac{x^4}{(x-1)^3}\,dx$