C12 - 5.8 - ln/e *+1 − 1 +* Long Div/Sep Frac Int Notes

$\int \frac{1}{x}dx$

$ln|x| + C$

$\int \frac{1}{x+1}dx$

$ln|x+1| + C$

$\int \frac{x}{x+1}\,dx$ $+1-1$

$\int \frac{x+1-1}{x+1}\,dx$

$\int \frac{x+1}{x+1} - \frac{1}{x+1}\,dx$ Separate Fractions

$\int 1 - \frac{1}{x+1}\,dx$ $\frac{a+b}{c} = \frac{a}{c} + \frac{b}{c}$

$x - \ln(x+1) + C$

$\int \frac{2}{x-2}dx$

$2\int \frac{1}{x-2}dx$

$2ln|x-2| + C$

$y = 2\ln|x-2|$

$y' = \frac{2}{x-2}$

$\int \frac{x}{x-2}\,dx = ?$

$\int (1 + \frac{2}{x-2})\,dx = ?$

$x + 2\ln(x-2) + C$

$x-2\overline{)\,x+0}$ $\quad 1$

$\underline{\;\;x-2\;\;}$

$\quad\;\; 2$

Long Division

$\frac{x}{x-2} = 1 + \frac{2}{x-2}$

$\frac{x}{x-2}$

$\frac{x-2+2}{x-2}$ $+2-2$

$\frac{x-2}{x-2} + \frac{2}{x-2}$ Separate Fractions

$1 + \frac{2}{x-2}$

$\int e^x = e^x + C$

$\int e^{2x} = \frac{e^{2x}}{2} + C$

Think: What would you have to divide by to reverse chain rule?

$\int 5^x = \frac{5^x}{ln5} + C$

$\int 7^{2x} = \frac{7^{2x}}{2ln7} + C$

$\int \frac{1}{1+e^x}\,dx$

$\int 1 - \frac{e^x}{1+e^x}\,dx$

$\int 1dx - \int \frac{e^x}{1+e^x}\,dx$

$x - \ln(1+e^x) + C$

$\frac{1}{1+e^x}$ $+e^x - e^x$

$\frac{1+e^x-e^x}{1+e^x}$

$\frac{1+e^x}{1+e^x} - \frac{e^x}{1+e^x}$

$1 - \frac{e^x}{1+e^x}$ Separate Fractions

$\int \frac{e^x}{1+e^x}\,dx$ $\quad u = e^x$

$\int \frac{e^x}{1+u}\frac{du}{e^x}$ $\quad \frac{du}{dx} = e^x$

$\int \frac{1}{1+u}du$ $\quad dx = \frac{du}{e^x}$

$\ln(1+u) + C$

$\ln(1+e^x) + C$

$\int \frac{e^x}{1+e^x}\,dx$ $\quad u = 1 + e^x$

$\int \frac{e^x}{u}\frac{du}{e^x}$ $\quad \frac{du}{dx} = e^x$

$\int \frac{1}{u}du$ OR $dx = \frac{du}{e^x}$

$lnu + C$

$\ln(1+e^x) + C$