EX:

$$f(x) = \operatorname{sech}(2x+1)$$

$$f'(x) = -2 \operatorname{sech}(2x+1) \tanh(2x+1)$$

EX:

$$f(x) = \tanh^3 x^2$$

$$f(x) = (\tanh x^2)^3$$

$$f'(x) = 3(\tanh x^2)^2 (\operatorname{sech} x^2) \cdot 2x$$

$$f'(x) = 6x \tanh^2 x^2 \operatorname{sech} x^2 .$$

Ex

$$\int \operatorname{sech}^2 x \, dx = \tanh x + C$$

EX:

$$\int \operatorname{csch} x \coth x \, dx = -\operatorname{csch} x + C$$

EX: $\int x \sinh x^2 \, dx = \frac{1}{2} \int (\sinh x^2) 2x \, dx$

$$= \frac{1}{2} \cosh x^2 + C$$

EX:

$$\int \operatorname{sech}^5 x \tanh x \, dx$$

$$= -\int (\operatorname{sech} x)^4 (-\operatorname{sech} x \tanh x) \, dx$$

$$= -\frac{(\operatorname{sech} x)^5}{5} + C = -\frac{1}{5} \operatorname{sech}^5 x + C$$

Exer: $\int \sec^5 x \tan x \, dx$

EX: $\int \tanh^2 x \operatorname{sech}^2 x \, dx$

$$= \int (\tanh x)^2 \operatorname{sech}^2 x \, dx$$

$$= \frac{(\tanh x)^3}{3} + C = \frac{1}{3} \tanh^3 x + C$$

EX:

$$\int \sin x \cos^7 x \, dx \qquad \cancel{= \int (\cos x)^6 \sin x \cos x \, dx}$$

$$-\int (\cos x)^7 (-\sin x) \, dx$$

$$= -\frac{(\cos x)^8}{8} + C = -\frac{1}{8} \cos^8 x + C$$

Ex:

$$\int \sinh x \cosh x \, dx$$

$$= \int (\sinh x)' \cosh x \, dx$$

$$= \frac{1}{2} \sinh^2 x + c$$

$$= \int (\cosh x)' \sinh x \, dx$$

$$= \frac{1}{2} \cosh^2 x + c$$

Exer:

$$\int \sin x \cos x \, dx$$

Ex:

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

$$\frac{1}{2 \times 3} = \frac{\frac{1}{2}}{3}$$

$$= \int \frac{1}{x \ln x} \, dx = \int \frac{\frac{1}{x}}{\ln x} \, dx$$

$$= \ln |\ln x| + c$$

Note:

$$\frac{d}{dx}(x^{-1}) = -x^{-2}$$

EX:

$$\int \frac{(x^{-1}+7)^4}{x^2}\,dx$$

$$= -\int (x^{-1}+7)^4(-x^{-2})\,dx$$

$$= -\frac{1}{5}(x^{-1}+7)^5 + c$$

قاعدة تكامل حاصل ضرب دالتين

$$\frac{d}{dx}(f\cdot g) = fg' + gf'$$

$$f\cdot g = \int fg' + \int gf'$$

$$\int fg' = f\cdot g - \int gf'$$

قاعدة

$$\int (\text{الأولى})(\text{الثانية})\,dx = (\text{الأولى})(\text{تكامل الثانية}) - \int (\text{تكامل الثانية})(\text{مشتقة الأولى})$$

EX: $\int \overset{①}{x}\,\overset{②}{\cos x}\,dx = x\sin x - \int \sin x\,dx$

$$= x\sin x - (-\cos x) + c$$

$$= x\sin x + \cos x + c$$