$$\int \frac{du}{u} = \ln|u| + K$$

$$\int \frac{f'(x)}{f(x)}\,dx = \ln|f(x)| + K$$

$$\int \tan u\,du = -\ln|\cos u| + K$$

$$\int \cot u\,du = \ln|\sin u| + K$$

$$\int \sec u\,du = \ln|\sec u + \tan u| + K$$

$$\int \csc u\,du = \ln|\csc u - \cot u| + K$$

$$\int x^n dx = \frac{x^{n+1}}{n+1},\ n \neq -1$$

$$\int x^{-1} dx = \int \frac{1}{x} dx$$

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

$$\int \tan x\,dx = \int \frac{\sin x}{\cos x} dx = \int -\frac{1}{u} du$$

$u = \cos x$

$du = -\sin x\,dx$

$-du = \sin x\,dx$

$$= -\ln|u| + c$$

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

5.2

11. $\displaystyle\int \frac{x^2+2x+3}{x^3+3x^2+9x}\,dx = \int \frac{1}{3}\frac{du}{u}$

$= \boxed{\frac{1}{3}\ln\left|x^3+3x^2+9x\right| + C}$

$u = x^3+3x^2+9x$

$du = (3x^2+6x+9)\,dx$

$du = 3(x^2+2x+3)\,dx$

$\frac{1}{3}du = (x^2+2x+3)\,dx$

7. $\displaystyle\int \frac{x}{x^2+1}\,dx = \int \frac{1}{2}\frac{du}{u}$

$u = x^2+1$

$du = 2x\,dx$

$\frac{1}{2}du = x\,dx$

$= \frac{1}{2}\ln\left|x^2+1\right| + C$

$= \boxed{\frac{1}{2}\ln(x^2+1) + C}$

9. $\int \frac{x^2-4}{x}\,dx = \int\left(\frac{x^2}{x} - \frac{4}{x}\right)dx$

$\cancel{u = x^2-4}$
$\cancel{du = 2x\,dx}$
$\cancel{\frac{1}{2}du = x\,dx}$

$= \int\left(x - \frac{4}{x}\right)dx$

$= \boxed{\frac{1}{2}x^2 - 4\ln|x| + C}$

5.2

34. $\int \frac{\csc^2 t}{\cot t}\,dt = \int -\frac{du}{u}$

$u = \cot t$
$du = -\csc^2 t\,dt$
$-du = \csc^2 t\,dt$

$= \boxed{-\ln|\cot t| + C}$

5.4

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

$[e^x]' = e^x$

5.5

$[a^x]' = a^x \cdot \ln a$

$$\int a^x dx = \frac{1}{\ln a} \cdot a^x + C$$

5.4

94. $$\int \frac{e^{1/x^2}}{x^3} dx = \int -\frac{1}{2} e^u du$$

$u = \frac{1}{x^2} = x^{-2}$

$du = -2x^{-3} dx$

$-\frac{1}{2} du = \frac{dx}{x^3}$

$$= -\frac{1}{2} e^u + C$$

$$= \boxed{-\frac{1}{2} e^{1/x^2} + C}$$

104. $$\int \frac{e^{2x}+2e^{x}+1}{e^{x}}\,dx$$

$$\frac{e^{2x}}{e^{x}} = e^{2x-x} = e^{x}$$

$$= \int (e^{x}+2+e^{-x})\,dx$$

$$= e^{x}+2x+\int e^{-x}\,dx$$

$u=-x$
$du=-dx$
$-du=dx$

$$= e^{x}+2x+\int -e^{u}\,du$$

$$= \boxed{e^{x}+2x-e^{-x}+C}$$

108. $$\int \ln(e^{2x-1})\,dx = \int (2x-1)\,dx$$

$$= \boxed{x^{2}-x+C}$$

$\log_a a^{x} = x$
$a^{\log_a x} = x$

5.5

68. $\int 2^{\sin x} \cos x\,dx = \int 2^u\,du$

$u = \sin x$
$du = \cos x\,dx$

$= \frac{1}{\ln 2} \cdot 2^u + C$

$= \boxed{\frac{2^{\sin x}}{\ln 2} + C}$

64. $\int_{-2}^{0} (3^3 - 5^2)\,dx$

$= \int_{-2}^{0} 2\,dx = 2x\Big|_{-2}^{0} = 2(0) - 2(-2)$

$= \boxed{4}$

5.4

102. $$\int \frac{2e^x - 2e^{-x}}{(e^x + e^{-x})^2}\,dx = \int \frac{2\,du}{u^2}$$

$u = e^x + e^{-x}$

$du = (e^x - e^{-x})dx$

$2du = (2e^x - 2e^{-x})dx$

$$= \int 2u^{-2}\,du$$

$$= -2u^{-1} + c$$

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

5.9 Inverse Trig Functions

$$\frac{d}{dx}[\arcsin u] = \frac{u'}{\sqrt{1-u^2}} \qquad \int \frac{du}{\sqrt{a^2-u^2}} = \arcsin\frac{u}{a} + c$$

$$\frac{d}{dx}[\arctan u] = \frac{u'}{1+u^2} \qquad \int \frac{du}{a^2+u^2} = \frac{1}{a}\arctan\frac{u}{a} + c$$

$$\frac{d}{dx}[\operatorname{arcsec} u] = \frac{u'}{|u|\sqrt{u^2-1}} \qquad \int \frac{du}{u\sqrt{u^2-a^2}} = \frac{1}{a}\operatorname{arcsec}\frac{|u|}{a} + c$$