Sec.5.2

p.324-327: Log Rule for Integration; Guidelines for Integration; Examples 1 - 3, 5, 7

p.330: Find the indefinite integral.

$u = x-5 \to du = dx$

6. $\int \frac{1}{x-5}\,dx = \int \frac{1}{u}\,du = \ln|u| + C = \boxed{\ln|x-5| + C}$

$u = 5-4x \to du = -4dx$

8. $\int \frac{9}{5-4x}\,dx = 9\int \frac{1}{5-4x}\,dx = \frac{9}{-4}\int \frac{1}{5-4x}(-4dx)$

$= -\frac{9}{4}\int \frac{1}{u}\,du = -\frac{9}{4}\ln|u| + C = \boxed{-\frac{9}{4}\ln|5-4x| + C}$

$u = \ln x \to du = \frac{1}{x}dx$

24. $\int \frac{dx}{x(\ln x^2)^3}$

$= \int \frac{dx}{x(2\ln x)^3} = \int \frac{dx}{8x(\ln x)^3} = \frac{1}{8}\int \frac{1}{(\ln x)^3}\cdot\left(\frac{1}{x}dx\right)$

$= \frac{1}{8}\int \frac{1}{u^3}\,du = \frac{1}{8}\int u^{-3}\,du = \frac{1}{8}\cdot\frac{u^{-2}}{-2} + C$

$= -\frac{1}{16u^2} + C = \boxed{-\frac{1}{16(\ln x)^2} + C}$

30. $\int \frac{4}{1+\sqrt{5x}}\,dx$

$u = 1+\sqrt{5x} = 1+(5x)^{1/2} \to du = \frac{1}{2}(5x)^{-1/2}\cdot 5dx$

$u - 1 = (5x)^{1/2}$ $\quad du = \frac{5}{2(5x)^{1/2}}dx$

$dx = \frac{2(5x)^{1/2}}{5}du$

$= \frac{2(u-1)}{5}du$

$= \int \frac{4}{u}\cdot\frac{2(u-1)}{5}\,du$

$= \frac{8}{5}\int \frac{u-1}{u}\,du = \frac{8}{5}\int\left(1-\frac{1}{u}\right)du$

$= \frac{8}{5}\left[u - \ln|u|\right] + C = \frac{8}{5}\left[1+\sqrt{5x} - \ln|1+\sqrt{5x}|\right] + C$

$= \underline{\frac{8}{5}} + \frac{8}{5}\sqrt{5x} - \frac{8}{5}\ln|1+\sqrt{5x}| + \underline{C} = \boxed{\frac{8}{5}\sqrt{5x} - \frac{8}{5}\ln|1+\sqrt{5x}| + C'}$

p.331: Evaluate the definite integral

$u = 2x+3 \to du = 2dx$

$x=-1: u = 2(-1)+3 = 1$

$x = 1: u = 2(1)+3 = 5$

52. $\int_{-1}^{1} \frac{1}{2x+3}\,dx$

$= \frac{1}{2}\int_{-1}^{1} \frac{1}{2x+3}(2dx) = \frac{1}{2}\int_{1}^{5}\frac{1}{u}\,du = \frac{1}{2}\left[\ln|u|\right]_1^5$

$= \frac{1}{2}\left[\ln|5| - \ln|1|\right] = \boxed{\frac{1}{2}\ln 5}$ or $\boxed{\ln\sqrt{5}}$

$\ln|1| = 0$, $\ln 5^{1/2}$

p.329: Integrals of Six Basic Trigonometric Functions; Example 10

p.330: Find the indefinite integral.

p.329: Integrals of Six Basic Trigonometric Functions; Example 10

p.330: Find the indefinite integral.

$u = 2\theta^2 \to du = 4\theta\, d\theta$

34. $\int \theta \tan 2\theta^2\, d\theta$

$= \frac{1}{4}\int \tan 2\theta^2 (4\theta\, d\theta) = \frac{1}{4}\int \tan u\, du = \frac{1}{4}[-\ln|\cos u|] + C$

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

$u = \frac{x}{2} \to du = \frac{1}{2}dx$

36. $\int \sec \frac{x}{2}\, dx$

$= 2\int \sec\frac{x}{2}\left(\frac{1}{2}dx\right) = 2\int \sec u\, du = 2\ln|\sec u + \tan u| + C$

$= \boxed{2\ln\left|\sec\frac{x}{2} + \tan\frac{x}{2}\right| + C}$

P.S. DE.

Find the particular solution of the differential equation that satisfies the initial condition(s).

DE I.C

44. $\frac{dy}{dx} = \frac{x-2}{x}, \quad (-1, 0)$

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

$y = \int \frac{x-2}{x} dx = \int \left(1 - \frac{2}{x}\right) dx = x - 2\ln|x| + C$ G.S.

@$(-1,0)$, $-1 - 2\ln|-1| + c = 0 \to -1 - 2\cancel{\ln 1}^{0} + c = 0 \to c = 1$

$\boxed{y = x - 2\ln|x| + 1}$ P.S.

Find the area of the region bounded by the graphs of the equations.

70. $y = \frac{5x}{x^2+2}, \quad x = 1, \quad x = 5, \quad y = 0$

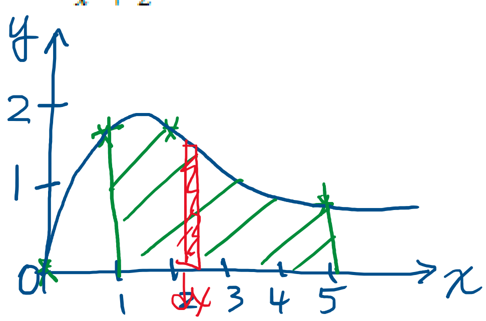
x	$y = \frac{5x}{x^2+2}$
1	$\frac{5}{3}$
5	$25/27$
0	0
2	$\frac{10}{6} = \frac{5}{3}$

$x=1$, $u = 1^2+2 = 3$

$x=5$, $u = 5^2+2 = 27$

$u = x^2+2$

$du = 2x\, dx$



$\text{Area} = \int_1^5 \frac{5x}{x^2+2} dx = 5\int_1^5 \frac{x}{x^2+2} dx = \frac{5}{2}\int_1^5 \frac{1}{x^2+2}(2x\, dx)$

$= \frac{5}{2}\int_3^{27} \frac{1}{u} du = \frac{5}{2}\left[\ln|u|\right]_3^{27} = \frac{5}{2}\left[\ln|27| - \ln|3|\right]$

$\ln 3^3 = 3\ln 3$

$= \frac{5}{2}[\ln 27 - \ln 3] = \frac{5}{2}[3\ln 3 - \ln 3] = \frac{5}{2}[2\ln 3]$

$= \boxed{5\ln 3}$