

Marshall Math - HW Solutions Course Calculus

$$\textcircled{\#1} \int \frac{1}{x+1} dx \quad \text{Let } u = x+1 \\ du = dx$$

$$= \int \frac{1}{u} du = \ln|u| + C$$

$$= \ln|x+1| + C$$

$$\textcircled{\#2} \int \frac{1}{x-5} dx \quad \text{Let } u = x-5 \\ du = dx$$

$$= \int \frac{1}{u} du = \ln|u| + C$$

$$= \ln|x-5| + C$$

$$\textcircled{\#3} \int \frac{1}{3-2x} dx \quad \text{Let } u = 3-2x \\ du = -2dx$$

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

$$= -\frac{1}{2} \int \frac{1}{u} du$$

$$= -\frac{1}{2} \ln|u| + C$$

$$= -\frac{1}{2} \ln|3-2x| + C$$

$$\textcircled{\#4} \int \frac{1}{6x+1} dx \quad \text{Let } u = 6x+1 \\ du = 6dx$$

$$= \frac{1}{6} \int \frac{6}{6x+1} dx$$

$$= \frac{1}{6} \int \frac{1}{u} du$$

$$= \frac{1}{6} \ln|u| + C$$

$$= \frac{1}{6} \ln|6x+1| + C$$

$$\textcircled{\#5} \int \frac{x}{x^2+1} dx \quad \text{Let } u = x^2+1 \\ du = 2x dx$$

$$= \frac{1}{2} \int \frac{2x}{x^2+1} dx$$

$$= \frac{1}{2} \int \frac{1}{u} du$$

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

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

$$= \ln \sqrt{x^2+1} + C$$

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$$\textcircled{\#6} \int \frac{x^2}{3-x^3} dx \quad \begin{array}{l} \text{Let } u=3-x^3 \\ du=-3x^2 dx \end{array}$$

$$= -\frac{1}{3} \int \frac{-3x^2}{(3-x^3)} dx$$

$$= -\frac{1}{3} \int \frac{1}{u} du$$

$$= -\frac{1}{3} \ln|u| + C$$

$$= -\frac{1}{3} \ln|3-x^3| + C$$

$$\textcircled{\#7} \int \frac{x^2-4}{x} dx$$

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

$$= \int x dx - 4 \int \frac{1}{x} dx$$

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

$$\textcircled{\#8} \int \frac{x}{\sqrt{9-x^2}} dx \quad \begin{array}{l} \text{Let } u=9-x^2 \\ du=-2x dx \end{array}$$

$$= -\frac{1}{2} \int \frac{1}{u^{1/2}} du$$

$$= -\frac{1}{2} \int u^{-1/2} du = \left(-\frac{1}{2}\right) \frac{u^{1/2}}{(1/2)} + C$$

$$= \left(-\frac{1}{2}\right) \left(\frac{2}{1}\right) u^{1/2} + C$$

$$= -(9-x^2)^{1/2} + C$$

$$= -\sqrt{9-x^2} + C$$

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$$\textcircled{\#33} \int_0^4 \frac{5}{3x+1} dx$$

$$\text{Let } u = 3x+1 \\ du = 3dx$$

$$\text{upper } u(4) = (3)(4)+1 \\ = 13 \\ \text{lower } u(0) = 3(0)+1 \\ = 1$$

$$= \frac{5}{3} \int_0^4 \frac{3}{3x+1} dx$$

$$= \frac{5}{3} \int_1^{13} \frac{1}{u} du = \frac{5}{3} [\ln|u|]_1^{13} = \frac{5}{3} (\ln 13 - \ln 1)$$

$$= \frac{5}{3} \ln 13$$

$$\approx 4.275$$

$$\textcircled{\#34} \int_{-1}^1 \frac{1}{x+2} dx$$

$$\text{Let } u = x+2 \\ du = dx$$

$$= \left[ \ln|x+2| \right]_{-1}^1 = \ln 3 - \ln 1 = \ln 3$$