

5.2 p. 380 (5, 7, 11, 13, 19, 21, 25, 29, 33, 37, 39, 45, 49)

5. $\int \frac{1}{3-2x} dx$ $u = 3-2x$
 $du = -2dx$

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

$$-\frac{1}{2} \int \frac{du}{u} = \boxed{-\frac{1}{2} \ln|3-2x| + C}$$

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

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

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

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

11. $\int \frac{x^2+2x+3}{x^3+3x^2+9x} dx$ $u = x^3+3x^2+9x$
 $du = (3x^2+6x+9) dx$
 $du = 3(x^2+2x+3) dx$

$$\frac{1}{3} \int \frac{3(x^2+2x+3) dx}{x^3+3x^2+9x}$$

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

$$\frac{1}{3} \ln|x^3+3x^2+9x| + C$$

$$\boxed{\ln \sqrt[3]{x^3+3x^2+9x} + C}$$

13. $\int \frac{x^2-3x+2}{x+1} dx$

$$\int \left(x - 4 + \frac{6}{x+1} \right) dx$$

$$\boxed{\frac{1}{2}x^2 - 4x + 6 \ln|x+1| + C}$$

$$\begin{array}{r} x-4 \\ x+1 \overline{) x^2-3x+2} \\ \underline{-x^2+x} \\ -4x+2 \\ \underline{-4x+4} \\ 6 \end{array}$$

29. $\int \frac{\cos \theta}{\sin \theta} d\theta$ $u = \sin \theta$
 $du = \cos \theta d\theta$

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

$$\ln|u| + C$$

$$\boxed{\ln|\sin \theta| + C}$$

19. $\int \frac{(\ln x)^2}{x} dx$ $u = \ln x$ $du = \frac{1}{x} dx$

$$\int u^2 du = \frac{1}{3} u^3 + C = \boxed{\frac{1}{3} (\ln x)^3 + C}$$

21. $\int \frac{1}{\sqrt{x+1}} dx$ $u = x+1$
 $du = dx$

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

$$2 u^{1/2} + C$$

$$\boxed{2\sqrt{x+1} + C}$$

25. $\int \frac{1}{1+\sqrt{2x}} dx$ $u = 1 + (2x)^{1/2}$
 $du = \frac{1}{2}(2x)^{-1/2}(2)$
 $du = \frac{1}{\sqrt{2x}} dx$

$$\sqrt{2x} \cdot du = dx$$

$$(u-1) du = dx$$

$$\int \frac{u-1}{u} du = \int \left(1 - \frac{1}{u} \right) du = u - \ln|u| + C$$

$$(1+\sqrt{2x}) - \ln|1+\sqrt{2x}| + C$$

$$\boxed{\sqrt{2x} - \ln|1+\sqrt{2x}| + C}$$

$$33. \int \frac{\cos t}{1+\sin t} dt \quad u=1+\sin t \\ du = \cos t dt$$

$$\int \frac{du}{u}$$

$$\ln|1+\sin t| + C$$

$$45. \int_1^e \frac{(1+\ln x)^2}{x} dx \quad u=1+\ln x$$

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

$$\text{If } x=1, u=1$$

$$x=e, u=2$$

$$\int_1^2 u^2 du$$

$$37. \frac{dy}{dx} = \frac{3}{2-x} \quad (1, 0)$$

$$y = \int \frac{3}{2-x} dx \quad u=2-x \\ du = -dx$$

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

$$y = -3 \ln|2-x| + C$$

$$0 = -3 \ln 1 + C$$

$$0 = C$$

$$y = -3 \ln|2-x|$$

$$\left. \frac{1}{3} u^3 \right|_1^2 = \frac{1}{3}(8) - \frac{1}{3}(1) = \left[\frac{7}{3} \right]$$

$$49. \int_1^2 \frac{1-\cos \theta}{\theta - \sin \theta} d\theta \quad u = \theta - \sin \theta \\ du = (1 - \cos \theta) d\theta$$

$$\text{If } x=1, u=1 - \sin 1$$

$$x=2, u=2 - \sin 2$$

$$\int_{1-\sin 1}^{2-\sin 2} \frac{du}{u} = \ln|u| \Big|_{1-\sin 1}^{2-\sin 2}$$

$$\ln|2-\sin 2| - \ln|1-\sin 1|$$

$$\ln \left| \frac{2-\sin 2}{1-\sin 1} \right|$$

$$39. \frac{ds}{d\theta} = \tan(2\theta) \quad (0, 2)$$

$$\frac{ds}{d\theta} = \frac{\sin(2\theta)}{\cos(2\theta)}$$

$$s = \int \frac{\sin(2\theta)}{\cos(2\theta)} d\theta \quad u = \cos(2\theta) \\ du = -2\sin(2\theta) d\theta$$

$$s = -\frac{1}{2} \int \frac{-2\sin(2\theta) d\theta}{\cos(2\theta)}$$

$$s = -\frac{1}{2} \ln|\cos(2\theta)| + C$$

$$2 = -\frac{1}{2} \ln|\cos 0| + C$$

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

$$2 = C$$

$$s = -\frac{1}{2} \ln|\cos(2\theta)| + 2$$