

1. Find each indefinite integral:

$$a. \int (x^3 + 6x + 1) dx = \frac{x^4}{4} + 3x^2 + x + C$$

$$b. \int (1-t)(2+t^2) dt = 2t - t^2 + \frac{1}{3}t^3 - \frac{1}{5}t^5 + C$$

$$c. \int (2 - \sqrt{x})^2 dx = 4x - \frac{8}{3}x^{\frac{3}{2}} + \frac{1}{2}x^2 + C$$

$$d. \int \frac{\sin(x)}{1 - \sin^2(x)} dx = \sec(x) + C$$

$$e. \int 3e^u + \sec^2(u) du = 3e^u + \tan(u) + C$$

$$f. \int x(1 + 2x^4) dx = \frac{1}{2}x^2 + \frac{2}{3}x^6 + C$$

$$g. \int (2e^x + 4\cos(x)) dx = 2e^x + 4\sin(x) + C$$

$$h. \int x\sqrt{x} dx = \frac{2}{5}x^{\frac{5}{2}} + C$$

$$i. \int \cos(x) - 2\sin(x) dx = \sin(x) + 2\cos(x) + C$$

$$j. \int \frac{y+5y^7}{y^3} dy = -\frac{1}{y} + y^5 + C$$

$$k. \int \frac{1+4x}{\sqrt{2x^2+x+1}} dx = 2\sqrt{2x^2+x+1} + C$$

$$l. \int (3x-2)^{20} dx = \frac{1}{63}(3x-2)^{21} + C$$

$$m. \int x^2(x^3+5)^9 dx = \frac{1}{30}(x^3+5)^{10} + C$$

$$n. \int \sqrt{4-t} dt = -\frac{2}{3}(4-t)^{\frac{3}{2}} + C$$

$$o. \int \frac{e^x}{e^x+1} dx = \ln(e^x+1) + C$$

$$p. \int \frac{\tan^{-1}(x)}{1+x^2} dx = \frac{1}{2}[\tan^{-1}(x)]^2 + C$$

$$q. \int \frac{[\ln(x)]^2}{x} dx = \frac{1}{3}[\ln(x)]^3 + C$$

$$r. \int \frac{x}{\sqrt{1-4x^2}} dx = -\frac{1}{4}\sqrt{1-4x^2} + C$$

$$s. \int \frac{z^2}{\sqrt{1+z^3}} dz = \frac{1}{2}(1+z^3)^{\frac{2}{3}} + C$$

$$t. \int \sec^3(x) \tan(x) dx = \frac{1}{3}\sec^3(x) + C$$

$$u. \int \sin^3(\theta) \cos(\theta) d\theta = \frac{1}{4}\sin^4(\theta) + C$$

$$v. \int \sqrt{3+x^2} x^3 dx = \frac{1}{5}(3+x^2)^{\frac{5}{2}} - (3+x^2)^{\frac{3}{2}} + C$$

$$w. \int x\sqrt{x-1} dx = \frac{2}{5}(x-1)^{\frac{5}{2}} + \frac{2}{3}(x-1)^{\frac{3}{2}} + C$$

$$x. \int \frac{x}{\sqrt[4]{x+2}} = \frac{4}{7}(x+2)^{\frac{7}{4}} - \frac{8}{5}(x+2)^{\frac{3}{4}} + C$$

$$y. \int \frac{x^2}{\sqrt{1-x}} - 2\sqrt{1-x} + \frac{4}{3}(1-x)^{\frac{3}{2}} - \frac{2}{5}(1-x)^{\frac{5}{2}} + C$$

$$z. \int x^5\sqrt{x^3+1} dx = \frac{2}{15}(x^3+1)^{\frac{5}{2}} - \frac{2}{9}(x^3+1)^{\frac{3}{2}} + C$$

2. Evaluate each definite integral:

$$a. \int_0^2 (6x^2 - 4x + 5) dx = 18$$

$$b. \int_{-3}^0 (5y^4 - 6y^2 + 14) dy = 231$$

$$c. \int_{-2}^2 (3u+1)^2 du = 52$$

$$d. \int_0^9 \sqrt{2t} dt = 18\sqrt{2}$$

$$e. \int_1^{64} \frac{1+\sqrt[3]{x}}{\sqrt{x}} dx = \frac{256}{5}$$

$$f. \int_{\frac{\pi}{4}}^{\frac{\pi}{3}} \sec(\theta) \tan(\theta) d\theta = 2 - \sqrt{2}$$

$$g. \int_0^7 \sqrt{4+3x} dx = 26$$

$$h. \int_0^{\frac{\pi}{3}} \frac{\sin(\theta)}{\cos^2(\theta)} d\theta = 1$$

$$i. \int_{-2}^1 x^2\sqrt{x+3} dx = \frac{136}{55}$$

$$j. \int_0^{13} \frac{dx}{\sqrt[3]{(1+2x)^2}} = 3$$

$$k. \int_{\frac{1}{6}}^{\frac{1}{2}} \csc(\pi t) \cot(\pi t) dt = \frac{1}{\pi}$$

$$l. \int_0^{\sqrt{3}} x^5\sqrt{x^2+1} dx = \frac{848}{105}$$