

$$1) \int \sqrt{3-2x} \, dx$$

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

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

$$y = -\frac{1}{3} u^{3/2} + C$$

$$y = -\frac{1}{3} (3-2x)^{3/2} + C$$

$$u = 3-2x$$

$$\frac{du}{dx} = -2$$

$$\frac{du}{-2} = dx$$

$$2) \int x^2 \sqrt{3x^3+7} \, dx$$

$$\int x^2 u^{1/2} \frac{du}{9x^2}$$

$$\int \frac{1}{9} u^{1/2} du$$

$$y = \frac{2}{27} u^{3/2} + C$$

$$y = \frac{2}{27} (3x^3+7)^{3/2} + C$$

$$u = 3x^3+7$$

$$\frac{du}{dx} = 9$$

$$\frac{du}{9x^2} = dx$$

$$3) \int \sin(4x+2) dx$$

$$\int \sin(u) \frac{du}{4}$$

$$\int \frac{1}{4} \sin(u) du$$

$$y = -\frac{1}{4} \cos(u) + C$$

$$y = -\frac{1}{4} \cos(4x+2) + C$$

$$u = 4x+2$$

$$\frac{du}{dx} = 4$$

$$\frac{du}{4} = dx$$

$$4) \int (2x+1)^3 dx$$

$$\int u^3 \frac{du}{2}$$

$$\int \frac{1}{2} u^3 du$$

$$y = \frac{1}{8} u^4 + C$$

$$y = \frac{1}{8} (2x+1)^4 + C$$

$$u = 2x+1$$

$$\frac{du}{dx} = 2$$

$$\frac{du}{2} = dx$$

$$5) \int (x^3 + x) \sqrt{4 - 2x^2 - x^4} dx$$

$$6) \int \sin^3 x \cos x dx$$

$$(x^3 + x) u^{\frac{1}{2}} \frac{du}{-4x^3 - 4x} \quad u = 4 - 2x^2 - x^4$$

$$\int u^3 \frac{du}{\cos(x)}$$

$$u = \sin x$$

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

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

$$\int u^3 du$$

$$y = \frac{1}{4} u^4 + C$$

$$\frac{du}{\cos(x)} =$$

$$\frac{1}{4} u^{\frac{1}{2}} du$$

$$y = \frac{1}{4} \sin^4(x) + C$$

$$= -\frac{2}{12} u^{\frac{3}{2}} + C$$

$$y = -\frac{1}{6} (4 - 2x^2 - x^4)^{\frac{3}{2}} + C$$

$$7) \int 3 \cos^2 x \sin x \, dx$$

$$\int 3u^2 \sin(x) \frac{du}{-\sin(x)}$$

$$\int -3u^2 \, du$$

$$y = -u^3 + c$$

$$y = -\cos^3(x) + c$$

$$u = \cos(x)$$
$$\frac{du}{dx} = -\sin(x)$$
$$\frac{du}{-\sin(x)} = dx$$

$$8) \int x^{1/3} \cos(3x^{4/3}) \, dx$$

$$\int x^{1/3} \cos(u) \frac{du}{4x^{1/3}}$$

$$\int \frac{1}{4} \cos(u) \, du$$

$$y = \frac{1}{4} \sin(u) + c$$

$$y = \frac{1}{4} \sin(3x^{4/3}) + c$$

$$u = 3x^{4/3}$$
$$\frac{du}{dx} = 4x^{1/3}$$
$$\frac{du}{4x^{1/3}} = dx$$

$$9) \int \frac{5k}{(4+k^2)^2} dk$$

$$u = 4+k^2$$

$$\int 5k u^{-2} \frac{du}{2k}$$

$$\frac{du}{dx} = 2k$$

$$\int \frac{5}{2} u^{-2} du$$

$$\frac{du}{2k} = dx$$

$$y = -\frac{5}{2} u^{-1} + C$$

$$y = -\frac{5}{2} (4+k^2)^{-1} + C$$

$$10) \int \left(\frac{x^3}{18} - 1 \right) x^2 dx$$

$$u = \frac{x^3}{18}$$

$$\int u \cdot x^2 \frac{du}{\frac{1}{6} x^2}$$

$$\frac{du}{dx} = \frac{3}{18} x^2$$

$$\int 6u du$$

$$\frac{du}{dx} = \frac{1}{6} x^2$$

$$y = 3u^2 + C$$

$$\frac{du}{\frac{1}{6} x^2} = dx$$

$$y = 3 \left(\frac{x^3}{18} - 1 \right)^2 + C$$

$$\int \left(\frac{1}{18} x^5 - x^2 \right) dx$$

$$y = \frac{1}{108} x^6 - \frac{1}{3} x^3 + C$$