

$$11) \int \frac{y^{3/10}}{3} - 7y^{-1/3} dy$$

$$= \frac{10}{39} y^{3/10} + 21 y^{-1/3} + C$$

$$16) \int x^4 \sqrt{-4+3x^5} dx \quad u = -4+3x^5$$

$$du = 15x^4 dx$$

$$\frac{1}{15} \int \sqrt{u} du \quad u^{1/2}$$

$$\frac{1}{15} \cdot \frac{2}{3} u^{3/2} + C$$

$$\frac{2}{45} (-4+3x^5)^{3/2} + C$$

$$* 12) \int \sqrt{4x-3} dx \quad u = 4x-3$$

$$du = 4 dx$$

$$\frac{1}{4} \int \sqrt{u} du \quad u^{1/2}$$

$$= \frac{1}{4} \cdot \frac{2}{3} u^{3/2} + C$$

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

$$17) \int \frac{20y^4}{(4y^5-3)^3} dy \quad u = 4y^5-3$$

$$du = 20y^4 dy$$

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

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

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

$$13) \int \sqrt{4-3z} dz \quad u = 4-3z$$

$$du = -3 dz$$

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

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

$$-\frac{2}{9} (4-3z)^{3/2} + C$$

$$14) \int (3-2b)^{1/5} db \quad u = 3-2b$$

$$du = -2 db$$

$$\int u^{1/5} du$$

$$= \frac{5}{6} u^{6/5} + C$$

$$-\frac{5}{12} (3-2b)^{6/5} + C$$

$$18) \int \frac{3y^6}{(2y^7-1)^5} dy \quad u = 2y^7-1$$

$$du = 14y^6 dy$$

$$\frac{3}{14} \int \frac{du}{u^5} = \frac{3}{14} \int u^{-5} du$$

$$= \frac{3}{14} \cdot \frac{u^{-4}}{-4} + C$$

$$= -\frac{3}{56} (2y^7-1)^{-4} + C$$

$$15) \int -6x^2 \sqrt{3-2x^3} dx \quad u = 3-2x^3$$

$$du = -6x^2 dx$$

$$\int \sqrt{u} du$$

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

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

"Mature" Integrals

$$\begin{aligned} 19) \int 3x \sqrt{1-3x} dx & \quad u=1-3x \rightarrow x = \frac{u-1}{-3} \\ & \quad du = -3dx \\ & \quad \left(\frac{-1}{3}\right) \int \frac{u-1}{-3} \sqrt{u} du \\ & = \frac{1}{9} \int (u - u^{-1/2}) du \rightarrow \frac{1}{9} \left(\frac{2}{3} u^{3/2} - \frac{2}{3} u^{1/2} \right) + C \\ & = \boxed{\frac{2}{45} (1-3x)^{3/2} - \frac{2}{27} (1-3x)^{1/2} + C} \end{aligned}$$

$$\begin{aligned} 20) \int 2x \sqrt{5x-3} dx & \quad u=5x-3 \quad x = \frac{u+3}{5} \\ & \quad du = 5dx \\ & \quad \frac{2}{5} \int \frac{u+3}{5} \sqrt{u} du \\ & \quad \frac{2}{25} \int (u^{3/2} + 3u^{1/2}) du \\ & \quad \frac{2}{25} \left(\frac{2}{5} u^{5/2} + 2u^{3/2} \right) + C \\ & = \boxed{\frac{4}{125} (5x-3)^{5/2} + \frac{4}{25} (5x-3)^{3/2} + C} \end{aligned}$$

$$\begin{aligned} 21) \int 4x \sqrt{5x-2} dx & \quad u=5x-2 \rightarrow x = \frac{u+2}{5} \\ & \quad du = 5dx \\ & \quad \frac{4}{5} \int \frac{u+2}{5} \sqrt{u} du \\ & \quad \frac{4}{25} \int (u^{3/2} + 2u^{1/2}) du \\ & \quad \frac{4}{25} \left(\frac{2}{5} u^{5/2} + \frac{4}{3} u^{3/2} \right) + C \\ & = \boxed{\frac{8}{125} (5x-2)^{5/2} + \frac{16}{75} (5x-2)^{3/2} + C} \end{aligned}$$

$$\begin{aligned} 22) \int \sin 3\theta d\theta & \quad u=3\theta \quad du = 3d\theta \\ & \quad \frac{1}{3} \int \sin u du = \boxed{-\frac{1}{3} \cos 3\theta + C} \end{aligned}$$

$$\begin{aligned}
 23) \quad & \int \frac{4}{3} \sin 3x \, dx & u &= 3x \\
 & = \frac{4}{3} \cdot \frac{1}{3} \int \sin u \, du & du &= 3 \, dx \\
 & = \frac{4}{9} \int \sin u \, du = \boxed{-\frac{4}{9} \cos 3x + C}
 \end{aligned}$$

$$\begin{aligned}
 24) \quad & \int 12x^2 \sin(4x^3) \, dx & u &= 4x^3 \\
 & = \int \sin u \, du & du &= 12x^2 \, dx \\
 & = \boxed{-\cos 4x^3 + C}
 \end{aligned}$$

$$\begin{aligned}
 25) \quad & \int 2x \cos 4x^2 \, dx & u &= 4x^2 \\
 & = \frac{1}{4} \int \cos u \, du & du &= 8x \, dx \\
 & = \boxed{\frac{1}{4} \sin 4x^2 + C}
 \end{aligned}$$

