

3A. Differentials, indefinite integration

1d)

$$d(e^{3x} \sin x)$$

$$(3e^{3x} \sin x + e^{3x} \cos x) dx$$

$$\boxed{e^{3x} (3 \sin x + \cos x) dx}$$

1e)

$$\sqrt{x} + \sqrt{y} = 1$$

$$y = (1 - \sqrt{x})^2$$

$$\begin{aligned} \frac{dy}{dx} &= 2(1 - \sqrt{x}) \cdot -\frac{1}{2\sqrt{x}} \\ &= -\frac{1}{\sqrt{x}}(1 - \sqrt{x}) \\ &= 1 - \frac{1}{\sqrt{x}} \end{aligned}$$

$$\boxed{dy = \left(1 - \frac{1}{\sqrt{x}}\right) dx}$$

2a)

$$\int (2x^4 + 3x^2 + x + 8) dx = \boxed{\frac{2}{5}x^5 + x^3 + \frac{1}{2}x^2 + 8x + C}$$

2c)

$$\int \sqrt{8+9x} dx = \boxed{\frac{2}{27} (8+9x)^{3/2} + C}$$

2e)

$$\int x(8-2x^2)^{-1/2} dx = \boxed{-\frac{1}{2} (8-2x^2)^{1/2} + C}$$

2g)

$$\int 7x^4 e^{x^5} dx = \boxed{\frac{7}{5} e^{x^5} + C}$$

2i)

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

2h)

$$\int \frac{x}{x+5} dx = ?$$

3a)

$$\int \sin(5x) dx = \boxed{-\frac{1}{5} \cos(5x) + C}$$

3c)

$$\int \cos^2 x \sin x dx = \boxed{-\frac{1}{3} \cos^3 x + C}$$

3e)

$$\int \sec^2 \frac{x}{5} dx = \boxed{5 \tan \frac{x}{5} + C}$$

3g)

$$\int \sec^q x \tan x dx = \boxed{\frac{1}{q} \sec^q x + C}$$