Methods Lesson 3

1 Differentiate $\ln(3x^2 + 7)$ and hence determine $\int \frac{x}{3x^2 + 7}\, dx$.

16. **WE14** Differentiate $\ln(3x^2 + 4)$ and hence determine an antiderivative of $\frac{x}{(3x^2 + 4)}$

10. The gradient function of a particular curve is given by $f'(x) = \cos(2x) - \sin(2x)$ Determine the rule for this function if it is known that the curve passes through the point $(\pi, 2)$.

5. **WE7** Determine $\int \frac{(2x + 5)^2}{x} dx$.

6. Determine $\int \frac{(3x + 2)^2}{x^2} dx$.

5. Determine:

a. $\int (e^{2x+1} - 4)^2 dx$

10. Determine the general rule for the function $y = f(x)$ if it is known that $\frac{dy}{dx} = x\left(1 - \frac{1}{x}\right)^2$.

10. Determine $\frac{d}{dx}\left(\ln(x^2 + 3)\right)$ and hence determine $\int \frac{12x}{(x^2 + 3)} dx$.

11. Differentiate $\frac{\cos(x)}{\sin(x)}$ and hence determine an antiderivative of $\frac{1}{\sin^2(x)}$.

12. a. Show that $\frac{6x - 5}{3 - 2x} = -3 + \frac{4}{3 - 2x}$.

b. Hence, determine $\int \frac{6x - 5}{3 - 2x}\, dx$.

6 A curve with equation $y = f(x)$ passes through the origin and its gradient is given by $f'(x) = 3x^2 - 8x + 3$.

a Find the equation of the curve.

b Find the x-axis intercepts of the curve.

6 An object is projected vertically upwards with a velocity of 25 m/s. (Its acceleration due to gravity is -10 m/s^2.) Find:

a the object's velocity at time t

b its height above the point of projection at time t

c the time it takes to reach its maximum height

d the maximum height reached

e the time taken to return to the point of projection.

1. **WE4** Evaluate the following definite integrals.

a. $\int_0^1 x^2\,dx$

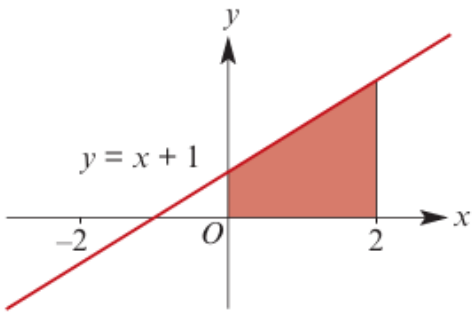
b. $\int_0^3 x^3\,dx$

c. $\int_0^{\pi} 5\sin\left(\frac{x}{4}\right)dx$

11. Determine the value of a if $\int_0^a e^{\frac{x}{2}}\,dx = 4$.

12. Determine a if $\int_0^a e^{-2x}\,dx = \frac{1}{2}\left(1 - \frac{1}{e^8}\right)$.

3 Part of the graph of $y = x + 1$ is shown to the right. Find the area of the shaded region.



4 Part of the graph of $y = x^2$ is shown to the right. Find the area of the shaded region.