

Evaluate the given indefinite integral:

1. $\int (6x^2 - 9x + 3) dx$

$$2x^3 - \frac{9}{2}x^2 + 3x + c$$

2. $\int 3x\sqrt{2x^2 + 3} dx$

$$u = 2x^2 + 3$$

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

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

$$\int \frac{3x u^{1/2}}{4x} du$$

$$\frac{3}{4} \int u^{1/2} du$$

$$\frac{3}{4} \cdot \frac{2}{3} u^{3/2} + c$$

$$\frac{1}{2} (2x^2 + 3)^{3/2} + c$$

3. $\int -4 \sec(x) \tan(x) dx$

$$-4 \sec x + c$$

4. $\int \frac{2x - 3\sqrt{x} + 5}{\sqrt[3]{x}} dx$

$$\int \frac{2x - 3x^{1/2} + 5}{x^{1/3}} dx$$

$$\int (2x^{2/3} - 3x^{1/6} + 5x^{-1/3}) dx$$

$$\frac{6}{5} x^{5/3} - \frac{18}{7} x^{7/6} + \frac{15}{2} x^{2/3} + c$$

$$\frac{6}{5} \sqrt[3]{x^5} - \frac{18}{7} \sqrt[6]{x^7} + \frac{15}{2} \sqrt[3]{x^2} + c$$

5. $\int 4x^2 \csc^2(2x^3) dx$

$$u = 2x^3$$

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

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

$$\int 4x^2 \csc^2(u) \frac{du}{6x^2}$$

$$\frac{2}{3} \int \csc^2(u) du$$

$$-\frac{2}{3} \cot(u) + c$$

$$-\frac{2}{3} \cot(2x^3) + c$$

6. $\int \sec^3(x) \tan(x) dx$

$$u = \sec(x)$$

$$\frac{du}{dx} = \sec(x) \tan(x)$$

$$\frac{du}{\sec(x) \tan(x)} = dx$$

$$\int \sec^2(x) \sec(x) \tan(x) dx$$

$$\int u^2 \sec(x) \tan(x) \frac{du}{\sec(x) \tan(x)}$$

$$\int u^2 du$$

$$\frac{1}{3} u^3 + c$$

$$\frac{1}{3} \sec^3(x) + c$$

Challenge Problem

$$\frac{\sqrt{(2x^2 + 3)^3}}{2} + c$$

7. $\int \frac{12x - 10}{\sqrt{3x^2 - 5x}} dx$

$$u = 3x^2 - 5x$$

$$\frac{du}{dx} = 6x - 5$$

$$\frac{du}{6x - 5} = dx$$

$$\int (12x - 10)(3x^2 - 5x)^{-1/2} dx$$

$$\int 2(6x - 5)(u)^{-1/2} \frac{du}{6x - 5}$$

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

$$4u^{1/2} + c$$

$$4(3x^2 - 5x)^{1/2} + c$$

$$4\sqrt{3x^2 - 5x} + c$$

8. $\int \frac{1}{\sqrt{x}} \cos(\sqrt{x}) dx$

$$\int x^{-1/2} \cos(x^{1/2}) dx$$

$$u = x^{1/2}$$

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

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

$$\int 2 \cos(u) du$$

$$2 \sin(u) + c$$

$$2 \sin(x^{1/2}) + c$$

$$2 \sin(\sqrt{x}) + c$$

9. $\int dx$

$$x + c$$

Find $f(x)$ given the following information:

10. $f'(x) = 6x - 5$
 $f(1) = 4$

$$\int (6x - 5) dx$$

$$f(x) = 3x^2 - 5x + c$$

$$4 = 3(1)^2 - 5(1) + c$$

$$4 = 3 - 5 + c$$

$$4 = -2 + c$$

$$6 = c$$

$$f(x) = 3x^2 - 5x + 6$$

11. $f'(x) = 3x(x^2 - 4)^3$
 $f(2) = -7$

$$u = x^2 - 4$$

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

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

$$y = \frac{3}{8}(x^2 - 4)^4 - 7$$

11.

$$\int (3x(x^2 - 4)^3) dx$$

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

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

$$\frac{3}{8} u^4 + c$$

$$y = \frac{3}{8} (x^2 - 4)^4 + c$$

$$-7 = \frac{3}{8} ((2)^2 - 4)^4 + c$$

$$-7 = c$$