

Exercise 8.4

1. Find the following integrals by using the formula

$$\int (ax + b)^n dx = \frac{(ax + b)^{n+1}}{a(n+1)} + c, n \neq -1.$$

(a) $\int (3x - 9)^9 dx$

(b) $\int (2 - 5x)^6 dx$

(c) $\int \frac{1}{(4x + 5)^3} dx$

(d) $\int \frac{1}{\sqrt[4]{3 + 5x}} dx$

(e) $\int \sqrt{1-x} + \frac{1}{\sqrt{1-x}} - \frac{1}{(1-x)^2} dx$

2. By using the formula $\int e^{ax+b} dx = \frac{1}{a} e^{ax+b} + c$, find the following integrals.

(a) $\int e^{2-5x} dx$

(b) $\int e^x(e^{2x} + e^{3x}) dx$

(c) $\int (e^{-x} + 2)^2 dx$

(d) $\int (e^x + \frac{1}{e^x})^2 dx$

(e) $\int \frac{e^{4x} + e^{-x}}{e^{3x}} dx$

3. By using the result $\int \frac{f'(x)}{f(x)} dx = \ln |f(x)| + c$, find the following integrals.

(a) $\int \frac{1}{2x} dx$

(b) $\int \frac{1}{3x+2} dx$

(c) $\int \frac{1}{3-2x} dx$

(d) $\int \frac{x+1}{x^2+2x+5} dx$

(e) $\int \frac{x^2}{x^3+1} dx$

(f) $\int \frac{\cos x}{2-\sin x} dx$

(g) $\int \frac{e^{3x}}{e^{3x}+1} dx$

(h) $\int \frac{1}{x \ln x} dx$

(i) $\int \frac{\sec^2 x}{1+\tan x} dx$

(j) $\int \frac{\sin x - \cos x}{\sin x + \cos x} dx$

4. Using the result $\int f(x) e^{f(x)} dx = e^{f(x)} + c$, write down the integrals of

(a) $\sec^2 x e^{\tan x}$

(b) $\frac{e^{\frac{1}{x}}}{x^2}$

(c) $\frac{e^{\sqrt{x}}}{\sqrt{x}}$

(d) $x e^{x^2}$

5. Write down $\int \frac{e^x}{1+e^x} dx$. Show that $\frac{1}{1+e^x} = 1 - \frac{e^x}{1+e^x}$.

Hence, find $\int \frac{1}{1+e^x} dx$.

Exercise 8.4

1. (a) $\frac{1}{30} (3x-9)^{10} + c$ (b) $-\frac{1}{35} (2-5x)^7 + c$

(c) $-\frac{1}{8(4x+5)^2} + c$ (d) $\frac{4}{15} (3+5x)^{\frac{3}{4}} + c$

(e) $-\frac{2}{3} \sqrt{(1-x)^3} - 2\sqrt{1-x} - \frac{1}{1-x} + c$

2. (a) $-\frac{1}{5} e^{2-5x} + c$

(b) $\frac{1}{3} e^{3x} + \frac{1}{4} e^{4x} + c$

(c) $-\frac{1}{2} e^{-2x} - 4e^{-x} + 4x + c$

(d) $\frac{1}{2} e^{2x} - \frac{1}{2} e^{-2x} + 2x + c$

(e) $e^x - \frac{1}{4} e^{-4x} + c$

3. (a) $\frac{1}{2} \ln |x| + c$

(b) $\frac{1}{3} \ln |3x+2| + c$

(c) $-\frac{1}{2} \ln |3-2x| + c$

(d) $\frac{1}{2} \ln |x^2+2x+5| + c$

(e) $\frac{1}{3} \ln |x^3+1| + c$

(f) $-\ln |2-\sin x| + c$

(g) $\frac{1}{3} \ln |e^{3x}+1| + c$

(h) $\ln |\ln |x|| + c$

(i) $\ln |1+\tan x| + c$

(j) $-\ln |\sin x + \cos x| + c$

4. (a) $e^{\tan x} + c$

(b) $-e^{\frac{1}{x}} + c$

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

(d) $\frac{1}{2} e^{x^2} + c$

5. $\ln |1+e^x| + c, x - \ln |1+e^x| + c$