C3 Integration

Specimen

7. *(a)* Find

(i) $\int e^{-4x+1}dx$,

(ii) $\int\left(\frac{1}{2x+1}+\frac{1}{(3x+7)^3}\right)dx$. [7]

(b) Evaluate $\int_0^{\frac{\pi}{2}} \sin 2x dx$. [3]

2005 Summer

7. *(a)* Find (i) $\int \frac{1}{(3x+7)}\,dx$ (ii) $\int e^{3x+2}\,dx$ (iii) $\int \frac{3}{(5x+2)^4}\,dx$. [6]

(b) Evaluate $\int_0^{\frac{\pi}{6}} \sin(4x+\frac{\pi}{6})dx$, writing your answer in surd form. [4]

2006 Winter

7. *(a)* Find

(i) $\int\left(\frac{4}{7x+2}+\frac{5}{(3x+1)^3}\right)dx$, [4]

(ii) $\int \cos 2x dx$. [2]

(b) Evaluate $\int_0^4 e^{\frac{x}{2}}\,dx$. [4]

2006 Summer

4. *(a)* (i) Find $\int_0^a (e^{2x} - 1)\,dx$.

(ii) Given that

$$\int_0^a (e^{2x} - 1)\,dx = \frac{1}{2}(9 - a)$$

show that

$$e^{2a} - a - 10 = 0.$$ [4]

7. *(a)* Find (i) $\int \frac{7}{(5x+2)^4}\,dx$, (ii) $\int \frac{2}{(8x+7)}\,dx$. [4]

(b) Evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \cos 3x\,dx$. [4]

2007 Winter

7. *(a)* Find

(i) $\int \frac{1}{(2x+3)^5}\,dx$

(ii) $\int e^{2-3x}\,dx$. [4]

(b) Evaluate $\int_0^2 \frac{6}{3x+2}\,dx$, expressing your answer as a single logarithm. [4]

(c) Evaluate $\int_0^{\frac{\pi}{4}} \cos\left(3x + \frac{\pi}{4}\right)\,dx$. [4]

2007 Summer

7. *(a)* Find (i) $\int \frac{1}{(5-2x)}\,dx$, (ii) $\int (3x+2)^{20}\,dx$,

(iii) $\int e^{7x}\,dx$. [7]

(b) Evaluate $\int_0^{\frac{\pi}{3}} \cos\left(3x + \frac{\pi}{3}\right)\,dx$. [4]

2008 Winter

7. *(a)* Find (i) $\int \sqrt{2x+3}\ \mathrm{d}x$, (ii) $\int \frac{3}{7x+2}\ \mathrm{d}x$,

(iii) $\int 5e^{2x-7}\mathrm{d}x$. [6]

(b) Evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \sin\left(4x+\frac{\pi}{6}\right)\ \mathrm{d}x$. [4]

2008 Summer

7. *(a)* Find (i) $\int \sin 3x\ \mathrm{d}x$, (ii) $\int \frac{2}{3x+5}\ \mathrm{d}x$, (iii) $\int e^{3x+4}\mathrm{d}x$. [6]

(b) Evaluate $\int_0^1 \frac{1}{(2x+1)^4}\ \mathrm{d}x$. [4]

2009 Winter

7. *(a)* Find (i) $\int \frac{7}{6x+5}\ \mathrm{d}x$, (ii) $\int \cos 5x\ \mathrm{d}x$. [4]

(b) Evaluate $\int_0^1 \frac{9}{(2x+1)^2}\ \mathrm{d}x$. [4]

2009 Summer

7. *(a)* Find (i) $\int \sin 5x \, dx$, (ii) $\int \frac{3}{(2x+7)^3} \, dx$. [4]

(b) Evaluate $\int_0^3 \frac{2}{5x+3} \, dx$, giving your answer correct to three decimal places. [4]

2010 Winter

6. *(a)* Find

(i) $\int \frac{1}{4x-7} \, dx$, (ii) $\int e^{3x-1} dx$, (iii) $\int \frac{5}{(2x+3)^4} \, dx$. [6]

(b) Evaluate $\int_0^{\frac{\pi}{4}} \sin\left(2x+\frac{\pi}{4}\right) dx$, expressing your answer in surd form. [4]

2010 Summer

6. *(a)* Find

(i) $\int \sqrt{7x-9} \, dx$, (ii) $\int e^{\frac{x}{6}} dx$, (iii) $\int \frac{4}{5x-1} \, dx$. [6]

(b) Evaluate $\int_2^4 \frac{8}{(3x-4)^3} \, dx$. [4]

2011 Winter

6. *(a)* Find

(i) $\int \cos 4x \, dx$, (ii) $\int 5e^{2-3x} dx$, (iii) $\int \frac{3}{(6x-7)^5} \, dx$. [6]

(b) Evaluate $\int_1^4 \frac{9}{2x+5} \, dx$, giving your answer correct to three decimal places. [4]

2011 Summer

6. *(a)* Find

(i) $\int \frac{9}{4x+3}\,dx$, (ii) $\int 3e^{5-2x}\,dx$, (iii) $\int \frac{5}{(7x-1)^3}\,dx$. [6]

(b) Evaluate $\int_0^{\frac{\pi}{3}} \cos\left(3x-\frac{\pi}{6}\right)dx$. [4]

2012 Winter

6. *(a)* Find each of the following, simplifying your answer wherever possible.

(i) $\int \sin\left(\frac{x}{4}\right)dx$, (ii) $\int e^{\frac{2x}{3}}\,dx$, (iii) $\int \frac{7}{8x-2}\,dx$. [6]

(b) Evaluate $\int_1^9 \frac{3}{\sqrt{5x+4}}\,dx$. [4]

2012 Summer

6. Find

(a) (i) $\int 3e^{2-\frac{x}{4}}\,dx$, (ii) $\int \frac{9}{(2x-3)^6}\,dx$, (iii) $\int \frac{7}{3x+1}\,dx$ [6]

(b) Given that $0 < a < \frac{\pi}{2}$ and that

$$\int_0^a \sin 2x\,dx = \frac{1}{4},$$

find the value of the constant a. [5]

2013 Winter

6. *(a)* Find

(i) $\int \cos\left(\frac{4x+5}{3}\right)dx$, (ii) $\int e^{2x+9}\,dx$, (iii) $\int \frac{3}{(7-2x)^6}\,dx$. [6]

(b) Express $\int_2^{44} \frac{1}{3x-4}\,dx$

in the form $\ln k$, where k is an integer whose value is to be found. [4]

2013 Summer

6. *(a)* Find

(i) $\int \cos\left(3x + \frac{\pi}{2}\right) \mathrm{d}x$, (ii) $\int \mathrm{e}^{3-4x} \, \mathrm{d}x$,

(iii) $\int \frac{7}{8x+5} \, \mathrm{d}x$. [6]

(b) Evaluate $\int_1^2 \frac{9}{(2x-1)^4} \mathrm{d}x$. [4]

2014 Winter

7. *(a)* Find each of the following, simplifying your answer wherever possible.

(i) $\int \mathrm{e}^{\frac{5x}{6}} \, \mathrm{d}x$, (ii) $\int \sqrt[3]{8x+1} \, \mathrm{d}x$, (iii) $\int \sin\left(1 - \frac{x}{3}\right) \mathrm{d}x$. [6]

(b) Given that $a > 2$, and that

$$\int_2^a \frac{1}{4x-1} \, \mathrm{d}x = 0{\cdot}284,$$

find the value of the constant a. Give your answer correct to one decimal place. [5]

2014 Summer

7. *(a)* Find each of the following, simplifying your answer wherever possible.

(i) $\int \cos(2 - 5x) \, \mathrm{d}x$, (ii) $\int \frac{4}{\mathrm{e}^{3x-2}} \, \mathrm{d}x$, (iii) $\int \frac{5}{\frac{1}{6}x - 3} \, \mathrm{d}x$. [6]

(b) Evaluate $\int_2^6 \sqrt{4x+1} \, \mathrm{d}x$. [4]

2015

7. *(a)* Find each of the following integrals, simplifying your answer wherever possible.

(i) $\int \frac{(7x^2 - 2)}{x} \, \mathrm{d}x$ (ii) $\int \sin\left(\frac{2x}{3} - \pi\right) \mathrm{d}x$ [5]

(b) Evaluate $\int_3^6 \frac{1}{\sqrt[4]{(5x-14)}} \, \mathrm{d}x$. [4]

2016

7. *(a)* Find each of the following, simplifying your answer wherever possible.

(i) $\int 7e^{5-\frac{3}{4}x}dx$ (ii) $\int \sin\left(\frac{2x}{3}+5\right)dx$ (iii) $\int \frac{8}{(9-10x)^3}dx$ [6]

(b) Given that $a > 0$ and that

$$\int_a^6 \frac{1}{4x+3}dx = 0{\cdot}1986,$$

find the value of the constant a. Give your answer correct to one decimal place. [5]

2017

6. *(a)* Find each of the following integrals, simplifying your answer wherever possible.

(i) $\int 8e^{2-5x}dx$ (ii) $\int \frac{6}{\sqrt[3]{4x-7}}dx$

(iii) $\int \cos\left(\frac{7x-9}{3}\right)dx$ [6]

(b) (i) Differentiate $\ln(3x^2-8)$ with respect to x.

(ii) **Use your answer to *(b)*(i)** to evaluate

$$\int_2^6 \frac{3x}{3x^2-8}dx.$$

Give your answer in the form $\ln k$, where k is an integer whose value is to be found. [6]