



The integral of e^x

QUESTION 1 Find:

a $\int e^x dx$

b $\int 5e^x dx$

c $\int e^{3x} dx$

d $\int e^{2x+3} dx$

e $\int 4e^{-x} dx$

f $\int e^{3-2x} dx$

g $\int (e^x + 2x) dx$

h $\int \frac{e^{4x}}{2} dx$

i $\int (x^2 - 8x - 6e^{-2x}) dx$

QUESTION 2 Find the exact value of:

a $\int_0^2 e^x dx$

b $\int_0^1 6e^x dx$

c $\int_0^3 e^{4x} dx$

d $\int_{-3}^{-1} e^{2x+7} dx$

e $\int_0^2 \frac{1}{2} e^{-2x} dx$

f $\int_1^3 e^{4-x} dx$

g $\int_1^2 (e^x - e^{-x}) dx$

h $\int_0^{\ln 2} 7e^x dx$

i $\int_1^2 (e^{3x} + x) dx$

The integral of $\frac{1}{x}$

QUESTION 1 Find:

a $\int \frac{dx}{x}$

b $\int \frac{6}{x} dx$

c $\int \frac{3}{x+2} dx$

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

e $\int \frac{3x^2}{x^3-2} dx$

f $\int \frac{3}{3x-7} dx$

g $\int \frac{8x}{x^2-3} dx$

h $\int \frac{dx}{4x-1}$

i $\int \frac{7}{1-2x} dx$

QUESTION 2 Find the exact value of:

a $\int_2^5 \frac{dx}{x-1}$

b $\int_1^e \frac{dx}{2x}$

c $\int_0^3 \frac{2x}{x^2+3} dx$

d $\int_2^4 \frac{3x^2+1}{x^3+x} dx$

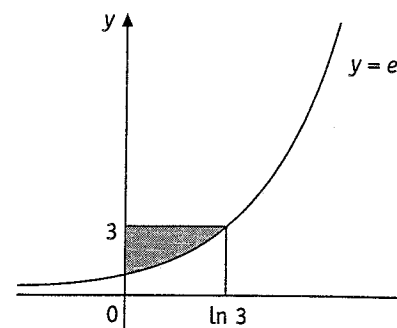
Logarithmic and exponential functions



Applications of integrals of e^x

QUESTION 1

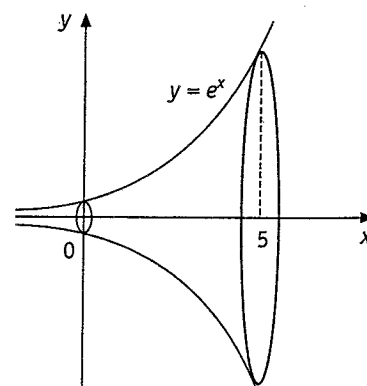
a Find the area bounded by the curve $y = e^x$, the x -axis, $x = 0$ and $x = \ln 3$



b Hence find the shaded area.

QUESTION 2 A curve $y = f(x)$ has a turning point at $(0, 4)$. If $f''(x) = e^x + e^{-x}$ find the equation of the

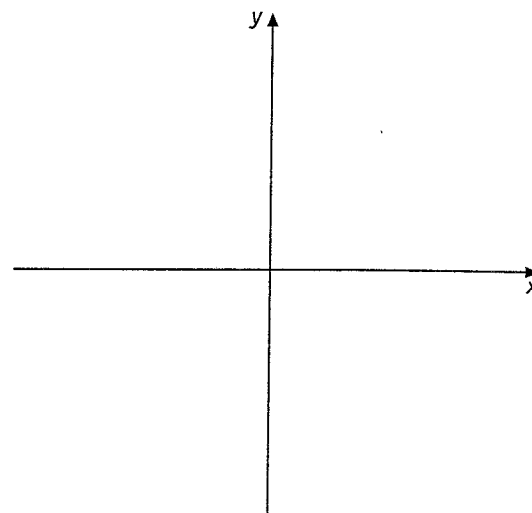
QUESTION 3 Show that the volume of the solid of revolution formed by rotating the curve $y = e^x$, between $x = 0$ and $x = 5$ about the x -axis is given by $\frac{\pi}{2}(e^{10} - 1)$ units³.





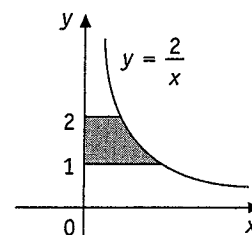
Applications of integration of $\frac{1}{x}$

QUESTION 1 Find the exact area bounded by the curve $y = \frac{4}{x}$, the x -axis and the ordinates $x = 2$ and $x = 4$



QUESTION 2 The gradient function of a curve is given by $6x - \frac{2}{2x - 1}$. Find the equation of the curve if it passes through the point $(1, 7)$.

QUESTION 3 Find the area shaded in the diagram.



Page 102 1 $10^{x+h} - 10^x, 10^h - 1, \frac{10^h - 1}{h}$ 2 a 2.30 b 0.69 c 1.10 3 a 2.30 b 0.69 c 1.10 4 a 2.72 5 1

6 a $(\ln 5)5^x$ b $(\ln 7)7^x$ c $(\ln 4)4^x$ d $(\ln 11)11^x$ e $(\ln 6)6^x$ f $(\ln 9)9^x$ g $(\ln 8)8^x$ h $(\ln 15)15^x$

Page 103 1 a 1 b 0 c 1 d 2 e 2 f 7 g 7 h 5 2 a 7.3891 b 54.5982 c 296.8263 d 0.3679 e 0.2231 f 2.0541
g 1.2809 h -1.4397 i 8.3178 j 81.3421 k 2.7183 l 3.3944 3 a 0.470 b 6.686 c 0.671 d -0.077 e 0.128 f -1.363

Page 104 1 a e^x b $3e^x$ c $2e^{2x}$ d $4e^x$ e $10e^{5x}$ f $-e^{-x}$ g $1 - e^x$ h $12e^{2x+5}$ i $-32e^{-8x}$ j $18x^2 - 9e^{3x}$ k $e^x + e^{-x}$ l $63e^{-9x}$
2 a $e^x(x+1)$ b $2xe^{2x}(x+1)$ c $e^{-x}(7-3x)$ d $5e^{7x}(7x^2 - 61x + 5)$

Page 105 1 a $4e^x(e^x + 5)^3$ b $3(4x - e^x)^2(4 - e^x)$ 2 a $\frac{1-x}{e^x}$ b $\frac{1-x}{e^x}$ 3 a $\frac{xe^x}{(x+1)^2}$ b $\frac{3e^x(x^2 - 2x - 5)}{(x^2 - 5)^2}$

Page 106 1 a $e^x + C$ b $5e^x + C$ c $\frac{1}{3}e^{3x} + C$ d $\frac{1}{2}e^{2x+3} + C$ e $-4e^{-x} + C$ f $-\frac{1}{2}e^{3-2x} + C$ g $e^x + x^2 + C$ h $\frac{e^{4x}}{8} + C$

i $\frac{x^3}{3} - 4x^2 + 3e^{-2x} + C$ 2 a $e^2 - 1$ b $6(e - 1)$ c $\frac{1}{4}(e^{12} - 1)$ d $\frac{e}{2}(e^4 - 1)$ e $\frac{1}{4}(1 - e^{-4})$ f $e(e^2 - 1)$ g $e^2 + e^{-2} - e - e^{-1}$

h 7 i $\frac{1}{3}e^6 - \frac{1}{3}e^3 + 1\frac{1}{2}$

Page 107 1 a $\frac{1}{x}$ b $\frac{1}{x}$ c $\frac{1}{x}$ d $\frac{7}{7x+5}$ e $\frac{-2}{1-2x}$ f $\frac{5}{5x+3}$ g $\frac{2}{x}$ h $\frac{5}{x}$ i $\frac{9}{x}$ j $\frac{2x}{x^2+5}$ k $\frac{6x}{3x^2-4}$ l $\frac{3x-14}{x^2-7x}$

2 a $\frac{2\ln x}{x}$ b $\frac{6}{3x-1}$

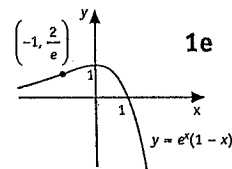
Page 108 1 a $\frac{1}{e}$ b $\frac{2}{2e-1}$ c $\frac{6e}{e^2+1}$ 2 a $1 + \ln x$ b $x^3(1 + 4\log_e x)$ c $\frac{1-2\ln x}{x^3}$ d $\frac{x\ln x - x - 1}{x(\ln x)^2}$

Page 109 1 a $\ln x + C$ b $6\ln x + C$ c $3\ln(x+2) + C$ d $\ln(x^2+5) + C$ e $\ln(x^3-2) + C$ f $\ln(3x-7) + C$

g $4\ln(x^2-3) + C$ h $\frac{1}{4}\ln(4x-1) + C$ i $-\frac{7}{2}\ln(1-2x) + C$ 2 a $\ln 4$ b $\frac{1}{2}$ c $\ln 4$ d $\ln 6.8$

Page 110 1 $2x - ey = 0$ 2 $e^{2x} - 2ey - e^2 + 4 = 0$ 3 $(0, 1)$ 4 $\frac{1}{e}$

Page 111 1 a $(1, 0)$ b maximum at $(0, 1)$ c $(-1, \frac{2}{e})$ d i $-\infty$ ii 0 e



Page 112 1 a 2 units² b $(3\ln 3 - 2)$ units² 2 $y = e^x + e^{-x} + 2$

Page 113 1 $4\ln 2$ units² 2 $y = 3x^2 - \ln(2x-1) + 4$ 3 $2\ln 2$ units²

Pages 114-119 1 A 2 D 3 D 4 C 5 A 6 B 7 A 8 B 9 D 10 C 11 C 12 A 13 a 2^{10x-1} b 2 14 a 6 b 0.2 c 2 15 a 0.462
b 1.563 c 3.459 16 a 0.921 b 1.13 c 0.209 17 a 3.759 b -0.768 c 1.233 18 a 9 b 4 c 8 19 a b (see next page) 20 a $(\ln 7)^x$