Logarithmic and exponential functions

EXCEL HSC MATHEMATICS
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The derivative of $y = e^x$ (1)

QUESTION **1** Find the derivative of:

a $y = e^x$

b $y = 3e^x$

c $f(x) = e^{2x}$

d $y = 4e^x + 3$

e $y = 2e^{5x}$

f $y = e^{-x}$

g $y = x - e^x$

h $y = 6e^{2x+5}$

i $f(x) = 4e^{-8x}$

j $y = 6x^3 - 3e^{3x}$

k $y = e^x - e^{-x}$

l $f(x) = 6 - 7e^{-9x}$

QUESTION **2** Use the product rule to differentiate:

a $y = xe^x$

b $y = x^2e^{2x}$

c $y = (3x - 4)e^{-x}$

d $y = 5e^{7x}(x^2 - 9x + 2)$

The derivative of $y = e^x$ (2)

QUESTION **1** Find the derivative of:

a $y = (e^x + 5)^4$

b $f(x) = (4x - e^x)^3$

QUESTION **2** Differentiate $y = \frac{x}{e^x}$, using:

a the product rule

b the quotient rule

QUESTION **3** Differentiate:

a $y = \frac{e^x}{x + 1}$

b $y = \frac{3e^x}{x^2 - 5}$

Logarithmic and exponential functions

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

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