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A LEVEL MATHS

(81) 'The' Exponential Function $y = e^x$

WORKING AT D/E

(1) **Sketch** the graph of $y = e^x$ showing where the graph crosses the y axis and stating the equation of the asymptote.

(2) Find the value of each, giving your answers to 2 decimal places:
(i) e^3 (ii) $e^{4.1}$ (iii) e^{-2}

(3) Find an expression for $\frac{dy}{dx}$ for each below:

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

(d) $y = e^x + x$ (e) $y = -e^x$ (d) $y = e^{-x}$

WORKING AT B/C

(1) (a) **Sketch** the graph of $y = 2e^x$ showing where the graph crosses the y axis and stating the equation of the asymptote.
(b) **Sketch** the graph of $y = 2 - e^x$ showing where the graph crosses the y axis and stating the equation of the asymptote.
(c) **Sketch** the graph of $y = e^{x-3}$ showing where the graph crosses the y axis **in exact form** and stating the equation of the asymptote.

(2) (a) Find a simplified expression for $f'(x)$ for each below:

(i) $f(x) = e^{4x+1}$ (ii) $f(x) = e^x + x^2$

(iii) $f(x) = 4e^{3x}$ (iv) $f(x) = e^x(e^x - 6)$

(b) Given $f(x) = 2e^{5x}$, find $f'(2)$ giving your answer to 1 decimal place.

(3) Given that $y = (e^x + 1)^2$, show that

$$\frac{dy}{dx} = 2e^{2x} + 2e^x$$

WORKING AT A*/A

(1) A curve has equation $y = a + be^x$ where a and b are constants. Given that the point $(-1,\ 5 + \frac{2}{e})$
(a) Find the values of a and b.
(b) **Sketch** the graph of $y = a + be^x$ showing where the graph crosses the y axis and stating the equation of the asymptote.
(c) State the range of values that y can take.

(2) $f(x) = 7 - 5e^{x-2}$
The graph of $y = f(x)$ crosses the y axis at the point P.
(a) Write down the exact coordinates of P.
(b) The range of $f(x)$ is $f(x) < q$. Find the value of q.
(c) Find an expression for $f'(x)$.
(d) Hence, find the gradient of the curve when $x = 3$ giving your answer in exact form.

(3) $y = e^{3x}$
The normal to the curve at the point with x coordinate 1, crosses the coordinate axes at the points A and B.
Find coordinates for A and B giving your answers as exact values.