1. Sketch the graph of each function
a. $y = 4e^{-x}$
b. $y = 2e^{x} + 5$
c. $y = 5 - 3e^{x}$
d. $y = \frac{1}{2}e^{-3x} + 1$
e. $y = -2e^{-x} + 5$

2. The population of rabbits in a wood is increasing according to the formula $P = 50 + 10e^{2t}$ where *P* is the population of rabbits and *t* is the time in years after 2000.
a. State the population in the year 2000.
b. Predict the population in the year 2030.
c. Sketch the graph of *P* against *t* from 2000 to 2020.

3. Sketch the graph of each function stating asymptotes and intercepts
a. $y = \ln(-x)$
b. $y = 2 + 5lnx$
c. $y = \ln(5 - x)$
d. $y = (lnx)^2$
e. $y = \ln(5x) + 5$

4. Sketch h(x) = 2 + ln (3 – x)
a. show the x and y intercepts
b. state the range and domain of h(x)
c. find the inverse function $h^{-1}(x)$

5. Solve the following equations giving exact answers
a. $e^{3x} = 2^2$
b. $2e^{-x} = 5$
c. $3\,ln(x) = 2$
d. $ln(2x - 1) = 6$
e. $3e^{3x} - 6 = 1$
f. $4e^{2x+1} = 12e^{x+2}$
g. $4\,ln\left(\frac{x}{3}\right) - 1 = 0$

6. The functions m and n are valid for all real numbers are $m: x \to 2x - 1$ and $n: x \to 3e^{-2x}$
a. state the range of n
b. sketch m^{-1} and n^{-1}
c. how many roots are there to $m^{-1}(x) = n^{-1}(x)$
d. find $mn(-\frac{1}{4})$

7. Solve the following equations giving the solution in terms of ln3
a. $e^{2x} = 9$
b. $e^{-5x} = \frac{1}{27}$
c. $2e^{3x} - 6 = 0$

8. The price of a laptop can be modelled by the equation
$P = 350 + e^{-\frac{t}{2}}$
where P is price in £s and t is age in years since purchase.
a. Calculate the price of the new laptop.
b. Calculate the price after 5 years.
c. When will it be worth less than £210?
d. Find its price at t = ∞.
e. Sketch P against t.
f. Is this an appropriate model?

9. The function $h(x) = 20 - 5e^{4x}$ $\{x > 0, x \in \mathbb{R}\}$
a. state the range of $h(x)$
b. find x to 2dp when $h(x) = 14$
c. find the exact value of the y- and x-intercepts
d. find $h^{-1}(x)$
e. sketch $h^{-1}(x)$ stating its range and domain

10. The points P and Q lie on the curve $y = \frac{1}{2}e^{-x}$. The x-coordinate of P is ln(4) and the y-coordinate of Q is e^4.
a. Find the equation of the line that passes through P and Q, using exact values.
b. Find the value of the y-intercept of line through P and Q
c. Calculate the length of PQ.