1. Variables x and y are connected such that when ln y is plotted against x, a straight line is obtained. The straight line passes through the points (1 , 5) and (3 , 1).

(i) Express y in terms of x. [2]

y=exp(-2x+7)

(ii) The straight line also passes through the point $(k , -3)$. Find the value of k. [2]

k=5

2. The variables x and y are related by the equation $y = \frac{3x^2}{2-x^3}$.

(i) Express the equation in the form $\frac{x^2}{y} = mx^3 + c$, such that it is in the form suitable for drawing a straight line graph. Find the value of m and of c. [4]

m=-1/3
c=2/3

(ii) The straight line makes an angle, θ, with respect to the x-axis. Given that θ is an obtuse angle, find the value of θ. [2]

161.6

3. In 2012, there were an estimated 2800 birds of a particular species in a certain country. Scientists believe that the number of these birds, N, can be modelled by the formula $N = 2800e^{-\frac{t}{20}}$, where t is the time in years after 2012.

(i) Estimate the number of birds in the year 2020. Correct your answer to the nearest whole number. [1]

1877

(ii) The species is labelled "under threat" when the number of birds falls below 1400. Estimate the year in which the species might be first labelled "under threat". [2]

2026

4. (a) Without using a calculator, solve the equation $4^{3y} + \log_2\left(\frac{1}{16}\right) = 28$. [3]

5/6

(b) Solve the equation $\log_3(x+2) + 2\log_9 x = 1$. [4]

x=1, -3(na), -1+/-sqrt(-8)/2(na)

5. Using long division, find the remainder when $2x^4 - 7x^3 + 3x^2 + 12x - 4$ is divided by $x^2 - x - 2$. [2]

4x

6. Given that $f(x) = 2x^3 + 3x^2 + ax + b$ is divisible by $x^2 - 4$, show that $a = -8$ and find the value of b. [3]

(i) Hence, or otherwise, solve the equation $f(x) = 0$. [2]

x=2, -3/2, -2

(ii) Sketch the graph of $y = f(x)$, indicate clearly the x and y intercepts. [3]

End of Paper