1. The remainder when $x^3 + kx^2 + 8$ is divided by $(x-3)$ is 12 more than the remainder when it is divided by $(x+1)$. Find the value of k. [3]

k=-2

2. Solve the equation $2x^3 + 2x^2 - 11x + 3 = 0$, giving your answers in exact form. [5]

x=-3 or (2+/-sqrt(2))/2

3. Given that $x^4 - 2x^2 + x - 1 \equiv (x^2 + A)(x+1)(x-1) + Bx + C$ for all values of x, find the value of A, of B and of C. [5]

A=-1, B=1, C=-2

4. If $\log_8 x = a$ and $\log_2 y = b$, express xy and $\frac{x}{y}$ in terms of a and b. Given that $xy = 128$ and $\frac{x}{y} = 32$, find the value of a and of b. [5]

a=2 b=1

5. Solve the following equations:

(a) $3^{2-x} = 8^{2x+3}$ [4]

x=-0.769

(b) $\log_5 x - 6\log_x 5 = 1$ [5]

x=125 or 1/25

6. The mass, m grams, of a radioactive substance present at a time t weeks after first being observed is given by the formula $m = ae^{bt}$ where a and b are constants. The initial mass of the substance is 120 g.

(i) If $t = \ln 32$ when the mass is half of its initial value, find the value of a and of b. [4]

a=120, b=-1/5

(ii) Hence, determine the amount of radioactive substance after 20 weeks. [2]

2.20

7. The variables x and y are related in such a way that when xy is plotted against $\frac{x}{y}$, a straight line graph is obtained. The line passes through the points $A(-2,5)$ and $B(4,-1)$. Form an equation in x and y and show that it reduces to $xy^2 = 3y - x$. [3]

8. Express the equation $y = ab^x + 2$ in the form $Y = mX + C$ for drawing a straight line graph. State the variables to be plotted on each axis and explain how the constants a and b can be obtained in terms of m and C. [4]

$a=10^c$
$b=10^m$

End of Paper