

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]
2. Solve the equation $2x^3 + 2x^2 - 11x + 3 = 0$, giving your answers in exact form. [5]
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]
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]
5. Solve the following equations:
 - (a) $3^{2-x} = 8^{2x+3}$ [4]
 - (b) $\log_5 x - 6\log_x 5 = 1$ [5]
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]
 - (ii) Hence, determine the amount of radioactive substance after 20 weeks. [2]
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]

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