**3** The polynomial $\mathrm{p}(x) = ax^3 - 9x^2 + bx - 6$, where $a$ and $b$ are constants, has a factor of $x - 2$. The polynomial has a remainder of 66 when divided by $x - 3$.

**(a)** Find the value of $a$ and of $b$. [4]

**(b)** Using your values of $a$ and $b$, show that $\mathrm{p}(x) = (x - 2)\mathrm{q}(x)$, where $\mathrm{q}(x)$ is a quadratic factor to be found. [2]

**(c)** Hence show that the equation $\mathrm{p}(x) = 0$ has only one real solution. [2]

© UCLES 2021

**4** The first 3 terms in the expansion of $(a+x)^3\left(1-\frac{x}{3}\right)^5$, in ascending powers of $x$, can be written in the form $27+bx+cx^2$, where $a$, $b$ and $c$ are integers. Find the values of $a$, $b$ and $c$. [8]