# Polynomials

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M/J/2005/Q5

The polynomial $x^4 + 5x + a$ is denoted by $\mathrm{p}(x)$. It is given that $x^2 - x + 3$ is a factor of $\mathrm{p}(x)$.

**(i)** Find the value of $a$ and factorise $\mathrm{p}(x)$ completely. [6]

**(ii)** Hence state the number of real roots of the equation $\mathrm{p}(x) = 0$, justifying your answer. [2]

M/J/2007/Q2

The polynomial $x^3 - 2x + a$, where $a$ is a constant, is denoted by $\mathrm{p}(x)$. It is given that $(x + 2)$ is a factor of $\mathrm{p}(x)$.

**(i)** Find the value of $a$. [2]

**(ii)** When $a$ has this value, find the quadratic factor of $\mathrm{p}(x)$. [2]

O/N/2007Q2

The polynomial $x^4 + 3x^2 + a$, where $a$ is a constant, is denoted by $\mathrm{p}(x)$. It is given that $x^2 + x + 2$ is a factor of $\mathrm{p}(x)$. Find the value of $a$ and the other quadratic factor of $\mathrm{p}(x)$. [4]

O/N/2008/Q5

The polynomial $4x^3 - 4x^2 + 3x + a$, where $a$ is a constant, is denoted by $\mathrm{p}(x)$. It is given that $\mathrm{p}(x)$ is divisible by $2x^2 - 3x + 3$.

**(i)** Find the value of $a$. [3]

**(ii)** When $a$ has this value, solve the inequality $\mathrm{p}(x) < 0$, justifying your answer. [3]

O/N/2009/Q5

The polynomial $2x^3 + ax^2 + bx - 4$, where $a$ and $b$ are constants, is denoted by $\mathrm{p}(x)$. The result of differentiating $\mathrm{p}(x)$ with respect to $x$ is denoted by $\mathrm{p}'(x)$. It is given that $(x + 2)$ is a factor of $\mathrm{p}(x)$ and of $\mathrm{p}'(x)$.

**(i)** Find the values of $a$ and $b$. [5]

**(ii)** When $a$ and $b$ have these values, factorise $\mathrm{p}(x)$ completely. [3]

The polynomial $x^4 + 3x^3 + ax + 3$ is denoted by $\mathrm{p}(x)$. It is given that $\mathrm{p}(x)$ is divisible by $x^2 - x + 1$.

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

**(ii)** When $a$ has this value, find the real roots of the equation $\mathrm{p}(x) = 0$. [2]

M/J/2013/Q4

The polynomial $ax^3 - 20x^2 + x + 3$, where $a$ is a constant, is denoted by $\mathrm{p}(x)$. It is given that $(3x + 1)$ is a factor of $\mathrm{p}(x)$.

**(i)** Find the value of $a$. [3]

**(ii)** When $a$ has this value, factorise $\mathrm{p}(x)$ completely. [3]

O/N/2014/Q5

The polynomial $ax^3 + bx^2 + x + 3$, where $a$ and $b$ are constants, is denoted by $\mathrm{p}(x)$. It is given that $(3x + 1)$ is a factor of $\mathrm{p}(x)$, and that when $\mathrm{p}(x)$ is divided by $(x - 2)$ the remainder is 21. Find the values of $a$ and $b$. [5]

The polynomial $8x^3 + ax^2 + bx - 1$, where $a$ and $b$ are constants, is denoted by $\mathrm{p}(x)$. It is given that $(x + 1)$ is a factor of $\mathrm{p}(x)$ and that when $\mathrm{p}(x)$ is divided by $(2x + 1)$ the remainder is 1.

**(i)** Find the values of $a$ and $b$. [5]

**(ii)** When $a$ and $b$ have these values, factorise $\mathrm{p}(x)$ completely. [3]

O/N/2019/Q3

The polynomial $x^4 + 3x^3 + ax + b$, where $a$ and $b$ are constants, is denoted by $\mathrm{p}(x)$. When $\mathrm{p}(x)$ is divided by $x^2 + x - 1$ the remainder is $2x + 3$. Find the values of $a$ and $b$. [5]