

Polynomial Functions #2

Practice Test (SAC) | Non-CAS

Question and Answer Book

Mathbanks Practice Assessment

-
- Reading time is **5 minutes**
 - Writing time is **45 minutes**

Materials supplied

- Question and Answer Book of 10 pages
- Formula Sheet

Instructions

Students are **not** permitted to bring any technology (calculators or software), or notes of any kind, into the assessment room.

Students are **not** permitted to bring mobile phones and/or any unauthorised electronic devices into the assessment room.

Contents

pages

6 questions (31 marks) 2–10



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Instructions

- Answer **all** questions in the spaces provided.
 - Write your responses in English.
 - In all questions where a numerical answer is required, an **exact** value must be given unless otherwise specified.
 - In questions where more than one mark is available, appropriate working **must** be shown.
 - Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.
-

Question 1 (5 marks)

Let $p(x) = 2x^3 + 3x^2 - 11x - 6$.

- a. Show that $(x - 2)$ is a factor of $p(x)$. 1 mark

- b. Hence solve $p(x) = 0$. 3 marks

c. State the coordinates of the y -intercept of the graph of $y = p(x)$.

1 mark

Question 2 (4 marks)

The polynomial $P(x) = x^3 + 3x^2 + ax + b$ leaves a remainder of 20 when divided by $x - 2$, and a remainder of -4 when divided by $x + 1$. Find the values of a and b .

Question 3 (4 marks)

The polynomial $x^3 + bx^2 + 10$ leaves a remainder of $2m$ when divided by $x + 1$, and a remainder of $m + 3$ when divided by $x - 2$. Find the values of b and m .

Question 4 (6 marks)

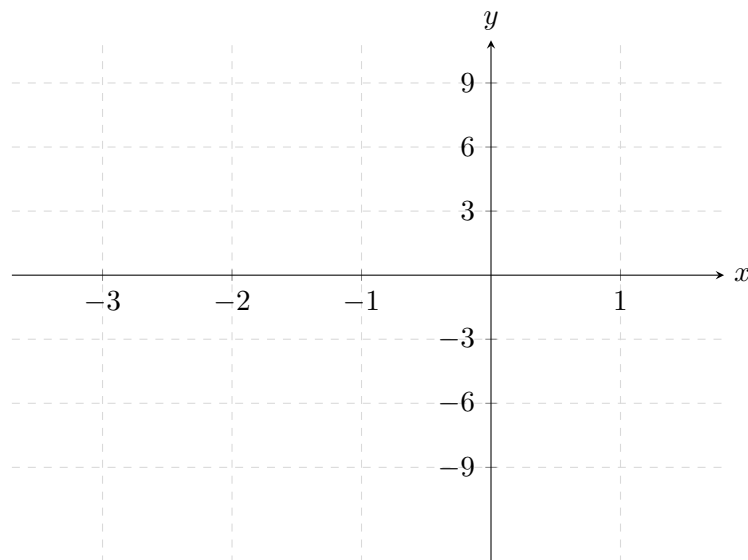
Consider $p(x) = 2x^3 + kx^2 - 9$, where k is a constant, and $(2x + 3)$ is a factor of $p(x)$.

- a. Find the value of k , and hence express $p(x)$ as a product of linear factors.

3 marks

- b. On the axes below, sketch the graph of $y = p(x)$, labelling all axis intercepts.

2 marks



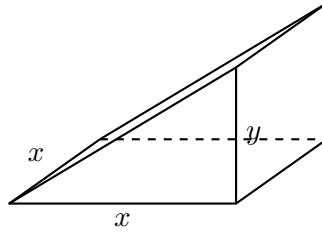
1 mark

When $p(x) = x^2 - 4x - c$ is divided by $(x - r)$, the remainder is -7 . Given that $c, r \in \mathbb{R}$, find the smallest possible value of c .

[illegible]

Question 6 (7 marks)

A triangular box is a right-angled triangular prism. Its triangular cross-section has a base of x mm and a height of y mm, and the prism has length x mm. The length, width and height of the box add together to give 24 mm.



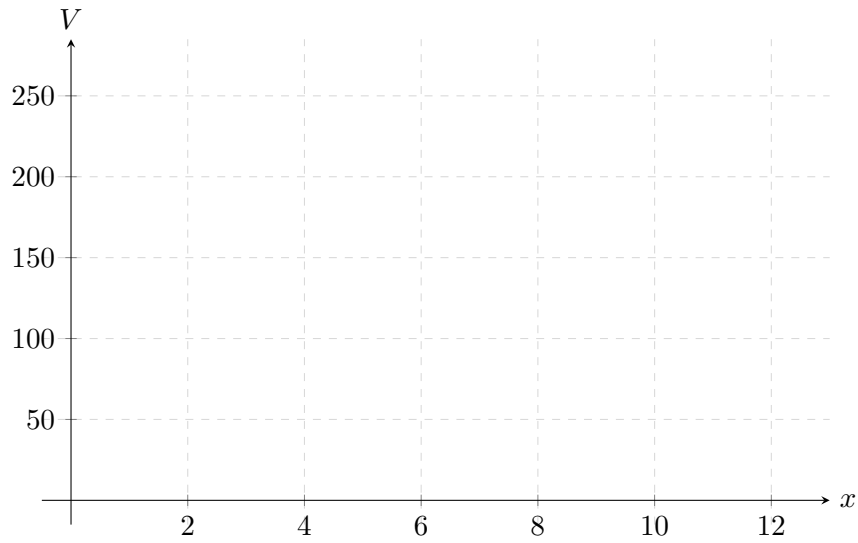
- a. Find an expression for the volume V of the box in terms of x .

2 marks

- b. State the restrictions on the values that x can take.

1 mark

- c. On the axes below, sketch the graph of x versus V , labelling the endpoints and the maximum. 2 marks



- d. Find the maximum volume of the box. 2 marks

Mathematical Methods Units 1 & 2 formulas

Functions and graphs

distance formula	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
midpoint formula	midpoint = $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

Straight line graphs

general equation	$y = mx + c$
equation through point (x_1, y_1)	$y - y_1 = m(x - x_1)$
gradient	$m = \frac{y_2 - y_1}{x_2 - x_1}$

Mensuration

circumference of a circle	$2\pi r$	area of a circle	πr^2
volume of a sphere	$\frac{4}{3}\pi r^3$	volume of a cylinder	$\pi r^2 h$

Calculus

$\frac{d}{dx}(x^n) = nx^{n-1}$	$\int x^n dx = \frac{1}{n+1}x^{n+1} + c, n \neq -1$
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Probability

$\Pr(A) = 1 - \Pr(A')$	$\Pr(A \cup B) = \Pr(A) + \Pr(B) - \Pr(A \cap B)$
$\Pr(A B) = \frac{\Pr(A \cap B)}{\Pr(B)}$	

About Mathbanks

Mathbanks is an online question bank for VCE Mathematics. It contains thousands of original, exam-style questions — each written with a complete worked solution and mark scheme — organised by topic and by difficulty across Mathematical Methods Units 1 & 2 and Units 3 & 4.

About This Test

This practice test features cubic and quartic polynomials, polynomial division, the remainder and factor theorems, and polynomial graphs, with a focus on non-CAS algebraic techniques commonly assessed in VCE Mathematical Methods Units 1 & 2. Students practise expanding and factorising polynomials, dividing polynomials to express them in quotient–remainder form, and applying the factor and remainder theorems to find unknown coefficients and locate roots. The test develops fluency with solving polynomial equations — using the null factor law, grouping, and known factors to find real solutions — and with equating coefficients to determine unknown constants. Graphing topics include sketching cubic and higher-degree polynomials from factored form, identifying x - and y -intercepts and the behaviour at repeated roots, and interpreting the effect of transformations on polynomial graphs. Students also reconstruct a polynomial rule from its graph and model and solve problems involving polynomial functions.



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