Mathbanks

VCE Mathematical Methods Unit 1/2 | Topic Test

Quadratic Functions

Practice Test (SAC) | Non-CAS

Question and Answer Book

Mathbanks Practice Assessment

- Reading time is **15 minutes**
- Writing time is **70 minutes**

Materials supplied

- Question and Answer Book of 16 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

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)

Solve the following equations and inequalities.

a. $x^2 - x - 6 = 0$ 2 marks

b. $x^2 - x - 6 < 0$ 2 marks

c. $x^2 - x - 6 > 0$ 1 mark

Question 2 (3 marks)

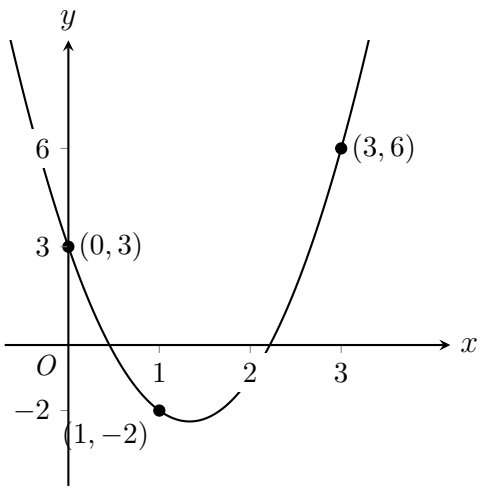
Consider the function f, where $f(x) = x^2 + 2x - 8$.

a. Find both x-intercepts. 2 marks

b. Find the x-coordinate of the vertex. 1 mark

Question 3 (3 marks)

The diagram below shows a parabola passing through the points $(0, 3)$, $(1, -2)$ and $(3, 6)$.



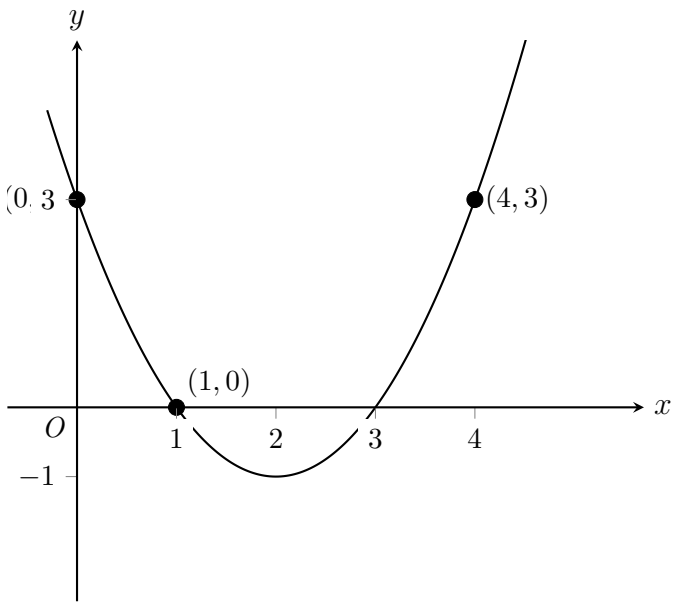
Find an expression for the parabola in the standard form $y = ax^2 + bx + c$.

Question 4 (3 marks)

A parabola has its vertex at the point with coordinates $(1, 3)$ and passes through the point $(3, 11)$. Find the equation of the parabola.

Question 5 (5 marks)

The diagram below shows a parabola passing through the points $(0, 3)$, $(1, 0)$ and $(4, 3)$.



a. Find an expression for the parabola in the standard form $y = ax^2 + bx + c$. 3 marks

b. Hence express the parabola in the form $y = a(x - h)^2 + k$. 2 marks

 Solution Link on Cover Page & End Page

Question 6 (11 marks)

The function f is defined by $f(x) = x^2 - 6x + k$ where $k \in \mathbb{R}$.

a. Find the discriminant in terms of k. 1 mark

b. Find the set of values of k for each of the following cases:

i. $f(x) = 0$ has exactly one distinct real root. 2 marks

ii. $f(x) = 0$ has two distinct real roots. 2 marks

iii. $f(x) = 0$ has no real roots. 2 marks

iv. $f(x) = 0$ has at least one real root. 2 marks

c. Find the set of values of k given that $f(x) > 0$ for any $x \in \mathbb{R}$. 2 marks

Question 7 (4 marks)

A parabola passes through the points $(1, 3)$, $(2, 6)$ and $(3, 13)$. Find an expression for the parabola in the standard form $y = ax^2 + bx + c$.

Question 8 (8 marks)

Consider the parabola $y = x^2 + 4x + 2k$ and the line $y = 2x + k$.

a. Find the set of values of k for each of the following cases:

i. the line is **tangent** to the parabola. 3 marks

ii. the line intersects the parabola at two points. 1 mark

iii. the line does **not** intersect the parabola. 1 mark

b. Find the unique point of intersection in case a. i. above. 2 marks

Question 9 (4 marks)

Consider the quadratic equation $x^2 - kx + (3k - 7) = 0$.

a. Find the values of k for which there are two solutions. 3 marks

b. Find the values of k for which there are no solutions. 1 mark

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	$\text{midpoint} = \left(\dfrac{x_1 + x_2}{2},\ \dfrac{y_1 + y_2}{2}\right)$

Straight line graphs

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

Mensuration

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

Calculus

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

Probability

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

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 VCE Mathematical Methods Units 1 & 2 Quadratic Functions practice test is a Non-CAS (technology-free) topic test written in the VCAA examination format. It covers solving quadratic equations and quadratic inequalities, factorising, completing the square and the quadratic formula, the discriminant and the nature of the roots (real, distinct, equal, or no real solutions), sketching parabolas, and finding turning points, axis intercepts and the axis of symmetry. Full worked solutions and mark schemes are available online at mathbanks.com.

Scan QR Code for
Test Solutions

Scan QR Code for
1000s More Exam Questions

Test Solution Link: `https://mathbanks.com/unit-1-2/topic-tests/quadratic-functions`

1000+ Exam Qs Questionbank: `https://mathbanks.com/unit-1-2/questionbank`