Exercise walk-through

Rational Functions and Zeros ▪ 1.8

eXercise

You must be able to

- find the real **zeros 零点** of a rational function from its numerator
- recognise which numerator zeros are excluded because they are outside the domain

Method — Zeros of a rational function

The real zeros of $r(x) = \dfrac{p(x)}{q(x)}$ are the real zeros of the **numerator** $p(x)$ — provided those inputs are **in the domain** (i.e. the denominator is not also zero there).

Method — Example

$r(x) = \dfrac{x-4}{x+1}$ has a zero at $x = 4$ (and $x = -1$ is excluded from the domain).

Practice 2.1 ▪ 1 mark

State where the real zeros of a rational function come from.

Solution 2.1

Method: Zeros of a rational function

Worked steps

from the real zeros of the numerator (that lie in the domain) **B1**.

Practice 2.2 ▪ 1 mark

For $r(x) = \dfrac{x-4}{x+1}$, state the zero.

Solution 2.2

Worked steps

$x = 4$ **B1**.

Practice 2.3 ▪ 1 mark

State why a numerator zero might **not** be a zero of r.

Solution 2.3

Method: Zeros of a rational function

Worked steps

if it is also a zero of the denominator, it is outside the domain (a hole, not a zero) **B1**.

Exam-style 3.1 ▪ 1 mark

The real zeros of a rational function come from the

A denominator

B numerator

C leading term

D degree

Solution 3.1

Method: Zeros of a rational function

A denominator

B numerator ✓

C leading term

D degree

Worked steps

B.

Exam-style 3.2 ▪ 1 mark

The function $r(x) = \dfrac{x-2}{x-2}$

A has a zero at 2

B has a hole at 2

C has an asymptote at 2

D is undefined everywhere

Solution 3.2

Method: Zeros of a rational function

A has a zero at 2

B has a hole at 2 ✓

C has an asymptote at 2

D is undefined everywhere

Worked steps

B.

Exam-style 3.3 ▪ 1 mark

$r(x) = \dfrac{x^2 - 9}{x - 1}$.

(a) State the zeros of the numerator.

(b) State the zeros of r.

(c) State the value excluded from the domain.

Solution 3.3

Method: Zeros of a rational function

Worked steps

(a) $x = 3$ and $x = -3$ **B1**. (b) $x = 3$ and $x = -3$ **B1**. (c) $x = 1$ **B1**.