

Solutions

Accept equivalent correct methods and supported interpretations. The marks check reasoning; they are not an official grade.

2.1 C – Conjugate product is $3^2 + 1^2 = 10$. A fails to cancel the imaginary cross terms; B subtracts rather than multiplying; D treats i^2 as $+1$ instead of -1 .

Correct response linked to the given case.

2.2 D – The principal square root is 9. A halves the base instead of taking its root; B chooses the negative root rather than principal value; C takes a fourth root.

Correct response linked to the given case.

2.3 5 – Real parts add to $4+1$; imaginary part is $-3i$.

Correct response linked to the given case.

2.4 False – A number plus its negative gives rational zero.

Correct response linked to the given case.

3.1 Multiply both parts by $1 - i$. Numerator is $(3 - 2i)(1 - i) = 3 - 5i + 2i^2 = 1 - 5i$. Denominator is 2. The answer is $1/2 - (5/2)i$. Multiplying back by $1 + i$ returns $3 - 2i$.

Sound conclusion or proposed method. Relevant supporting steps or textual evidence
. Accurate conditions, checks or qualification.

3.2 The fifth root of 32 is 2, so $32^{2/5} = 2^2 = 4$. The principal square root is $|-7| = 7$. For the equation, $z^2 = -16$ gives $z = 4i, -4i$, both nonreal.

Sound conclusion or proposed method. Relevant supporting steps or textual evidence.
Accurate conditions, checks or qualification.

3.3 $\sqrt{2}\sqrt{2} = 2$ is rational. $\sqrt{2}\sqrt{3} = \sqrt{6}$ is irrational. Neither closure nor nonclosure for all products follows from the label irrational alone.

Sound conclusion or proposed method. Relevant supporting steps or textual evidence.
Accurate conditions, checks or qualification.

3.4 $\sqrt{50} = 5\sqrt{2}$ is irrational, while $\sqrt{50}\sqrt{2} = \sqrt{100} = 10$ is rational. $32^{2/5} = (\sqrt[5]{32})^2 = 2^2 = 4$ and $2^{-3} = 1/2^3 = 1/8$. The two irrational numbers sum to zero, which is rational; irrational numbers are not closed under addition. These even-root products use nonnegative real radicands.

Sound conclusion or proposed method. Relevant supporting steps or textual evidence.
Accurate conditions, checks or qualification.