

Name: _____

PHYS2502 Mathematical Physics S23 Quiz #1 19 Jan 2023

You have fifteen minutes to complete this quiz. You may use books, notes, or computers you have with you, but you may not communicate with anyone other than the instructor.

Write your solution on this page, plus the back if necessary, and additional sheets if absolutely necessary. You must show the steps of your solution.

Given the two complex numbers

$$z_1 = 1 + i \quad \text{and} \quad z_2 = 3 - 4i$$

find the following:

- (a) z_1^2
- (b) z_1^*
- (c) $z_1 z_2^*$
- (d) $|z_1|$ and $|z_2|$
- (e) $|z_1 z_2|$

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$$z_1^2 = (1 + i)^2 = 1 + 2i - 1 = 2i$$

$$z_1^* = 1 - i$$

$$z_1 z_2^* = (1 + i)(3 + 4i) = 3 + 3i + 4i - 4 = -1 + 7i$$

$$|z_1| = \sqrt{1+1} = \sqrt{2} \quad \text{and} \quad |z_2| = \sqrt{9+16} = 5$$

$$\begin{aligned} |z_1 z_2| &= |(1 + i)(3 - 4i)| = |3 + 3i - 4i + 4| = |7 - i| = \sqrt{49 + 1} = 5\sqrt{2} \\ &= |z_1| |z_2| \end{aligned}$$