This key should allow you to understand why you choose the option you did (beyond just getting a question right or wrong). More instructions on how to use this key can be found here.

If you have a suggestion to make the keys better, please fill out the short survey here.

Note: This key is auto-generated and may contain issues and/or errors. The keys are reviewed after each exam to ensure grading is done accurately. If there are issues (like duplicate options), they are noted in the offline gradebook. The keys are a work-in-progress to give students as many resources to improve as possible.

---

1. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(-5 + 8i)(-2 + 7i)$$

The solution is $-46 - 51i$, which is option B.

A. $a \in [58, 68]$ and $b \in [19, 21]$

$66 + 19i$, which corresponds to adding a minus sign in the second term.

B. $a \in [-49, -43]$ and $b \in [-58, -48]$

* $-46 - 51i$, which is the correct option.

C. $a \in [58, 68]$ and $b \in [-23, -18]$

$66 - 19i$, which corresponds to adding a minus sign in the first term.

D. $a \in [-49, -43]$ and $b \in [46, 55]$

$-46 + 51i$, which corresponds to adding a minus sign in both terms.

E. $a \in [9, 11]$ and $b \in [55, 58]$

$10 + 56i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

---

2. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{-72 + 33i}{5 + 4i}$$

The solution is $-5.56 + 11.05i$, which is option E.

A. $a \in [-228.5, -227]$ and $b \in [10, 12.5]$

$-228.00 + 11.05i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

B. $a \in [-12.5, -10.5]$ and $b \in [-3.5, -2.5]$

$-12.00 - 3.00i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

C. $a \in [-6, -5]$ and $b \in [452.5, 453.5]$

$-5.56 + 453.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

D. $a \in [-15.5, -13]$ and $b \in [8, 9.5]$

$-14.40 + 8.25i$, which corresponds to just dividing the first term by the first term and the second by the second.

E. $a \in [-6, -5]$ and $b \in [10, 12.5]$

* $-5.56 + 11.05i$, which is the correct option.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

---

3. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{18 - 88i}{-3 - i}$$

The solution is $3.40 + 28.20i$, which is option A.

A. $a \in [3, 4]$ and $b \in [27.5, 29.5]$

* $3.40 + 28.20i$, which is the correct option.

B. $a \in [3, 4]$ and $b \in [281.5, 282.5]$

$3.40 + 282.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

C. $a \in [-6.5, -4.5]$ and $b \in [86.5, 88.5]$

$-6.00 + 88.00i$, which corresponds to just dividing the first term by the first term and the second by the second.

D. $a \in [-15.5, -14]$ and $b \in [24, 25]$

$-14.20 + 24.60i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

E. $a \in [33.5, 35.5]$ and $b \in [27.5, 29.5]$

$34.00 + 28.20i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

---

4. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(-10 + 9i)(5 - 6i)$$

The solution is $4 + 105i$, which is option E.

A. $a \in [-55, -47]$ and $b \in [-61, -52]$

$-50 - 54i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

B. $a \in [-107, -102]$ and $b \in [-16, -14]$

$-104 - 15i$, which corresponds to adding a minus sign in the second term.

C. $a \in [0, 7]$ and $b \in [-108, -102]$

$4 - 105i$, which corresponds to adding a minus sign in both terms.

D. $a \in [-107, -102]$ and $b \in [13, 18]$

$-104 + 15i$, which corresponds to adding a minus sign in the first term.

E. $a \in [0, 7]$ and $b \in [102, 112]$

* $4 + 105i$, which is the correct option.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.
