Complex Numbers

Problems about complex numbers.

Problem 1 *Which of the following are rational numbers? Select all that apply.*

Select All Correct Answers:

(a) 7 ✓

(b) e

(c) $\dfrac{\pi^2}{6}$

(d) $\dfrac{18}{11}$ ✓

(e) $8 - 3i$

(f) $\sqrt{-17}$

(g) $\sqrt[3]{-2}$

Problem 2 *Which of the following are real numbers? Select all that apply.*

Select All Correct Answers:

(a) 7 ✓

(b) e ✓

(c) $\dfrac{\pi^2}{6}$ ✓

(d) $\dfrac{18}{11}$ ✓

(e) $8 - 3i$

(f) $\sqrt{-17}$

(g) $\sqrt[3]{-2}$ ✓

Problem 3 *Which of the following are complex numbers? Select all that apply.*

Select All Correct Answers:

(a) 7 ✓

(b) e ✓

(c) $\dfrac{\pi^2}{6}$ ✓

(d) $\dfrac{18}{11}$ ✓

(e) $8 - 3i$ ✓

(f) $\sqrt{-17}$ ✓

(g) $\sqrt[3]{-2}$ ✓

Problem 4 *Assuming none of the numbers involved are zero, select all operations below which must produce an irrational number.*

Select All Correct Answers:

(a) *rational + rational*

(b) *rational + irrational* ✓

(c) *irrational + irrational*

(d) *rational × rational*

(e) *irrational × rational* ✓

(f) *irrational × irrational*

Problem 5 *Find* $(2 + i) + 4.$ $\boxed{6}$ $+$ $\boxed{1}$ i
 given given

Problem **6** *Find* $(-3 + 4i) - (-8 - i)$. $\boxed{5}$ $+$ $\boxed{5}$ i
given   given

Problem **7** *Find* $(2 - 6i) - (3 + 8i)$. $\boxed{-1}$ $+$ $\boxed{-2}$ i
given   given

Problem **8** *Find* $(2 + i) \times 4$. $\boxed{8}$ $+$ $\boxed{4}$ i
given   given

Problem **9** *Find* $(-3 + 4i) \times (-8 - i)$. $\boxed{28}$ $+$ $\boxed{35}$ i
given   given

Problem **10** *Find* $(2 - 6i) \times (3 + 8i)$. $\boxed{54}$ $+$ $\boxed{-2}$ i
given   given

Problem **11** *Write* $\dfrac{1}{2 + i}$ *in the form* $a + bi$. $\boxed{\dfrac{2}{3}}$ $+$ $\boxed{-\dfrac{1}{3}}$ i
given   given

Hint: *Try multiplying the numerator and denominator by something that will make the denominator into a whole number (in other words, the complex conjugate of* $2+i$*).*

Problem **12** *Find* $(1 - 3i) \div (-3 + 5i)$. $\boxed{-\dfrac{18}{34}}$ $+$ $\boxed{\dfrac{4}{34}}$ i
given   given

Hint: *First find* $\dfrac{1}{-3 + 5i}$*, and then multiply.*

Problem **13** *Find all solutions to the equation* $x^3 - 3x^2 + 5x - 3 = 0$.

Hint: *The Rational Root Theorem combined with some division of polynomials might help!*

Enter your answers: first complex answers, and then real answers in order from smallest to largest.

$\boxed{1}$ $+$ $\boxed{\sqrt{2}}$ i, $\boxed{1}$ $-$ $\boxed{\sqrt{2}}$ i, $\boxed{1}$
given   given   given   given   given

Problem   14   *Find all solutions to the equation* $x^3 + 2x - 3 = 0$.

Hint: *The Rational Root Theorem combined with some division of polynomials might help!*

Enter your answers: first complex answers, and then real answers in order from smallest to largest.

$$\boxed{-\dfrac{1}{2}}_{\text{given}} + \boxed{\dfrac{\sqrt{11}}{2}}_{\text{given}} i, \ \boxed{-\dfrac{1}{2}}_{\text{given}} - \boxed{\dfrac{\sqrt{11}}{2}}_{\text{given}} i, \ \boxed{1}_{\text{given}}$$

Problem   15   *Find all solutions to the equation* $x^3 + 2x - 3 = 0$.

Hint: *The Rational Root Theorem combined with some division of polynomials might help!*

Enter your answers: first complex answers, and then real answers in order from smallest to largest.

$$\boxed{0}_{\text{given}} + \boxed{\sqrt{5}}_{\text{given}} i, \ \boxed{0}_{\text{given}} - \boxed{\sqrt{5}}_{\text{given}} i, \ \boxed{-3}_{\text{given}}, \ \boxed{-3}_{\text{given}}$$