

# Algebra: Rationalizing Complex Numbers

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_

**DIRECTIONS***Simplify each expression by rationalizing. Multiply numerator and denominator by the conjugate or by  $i$  as needed.***1** Simplify:

$$1 / i$$

Answer: \_\_\_\_\_

**2** Simplify:

$$3 / i$$

Answer: \_\_\_\_\_

**3** Rationalize:

$$1 / (1+i)$$

Answer: \_\_\_\_\_

**4** Rationalize:

$$2 / (1-i)$$

Answer: \_\_\_\_\_

**5** Simplify:

$$(2+i) / (2-i)$$

Answer: \_\_\_\_\_

**6** Simplify:

$$(1+2i) / (1-2i)$$

Answer: \_\_\_\_\_

**7** Rationalize:

$$5 / (2+i)$$

Answer: \_\_\_\_\_

**8** Simplify:

$$(3-i) / (3+i)$$

Answer: \_\_\_\_\_

**9** Simplify:

$$i / (1+i)$$

Answer: \_\_\_\_\_

**10** Simplify:

$$(2+3i) / i$$

Answer: \_\_\_\_\_

# Answer Key & Solutions

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## TEACHER NOTES

Use conjugate ( $a-bi$ ) when denominator is  $a+bi$ . Recall  $i^2 = -1$ . Final answer must be in  $a+bi$  form with no  $i$  in denominator

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$$\begin{aligned} 1 \quad & 1 / i \\ & = -i \end{aligned}$$

Multiply by  $i$ :  $i/i^2 = i/(-1) = -i$

$$\begin{aligned} 2 \quad & 3 / i \\ & = -3i \end{aligned}$$

$3i / i^2 = 3i/(-1) = -3i$

$$\begin{aligned} 3 \quad & 1 / (1+i) \\ & = (1-i) / 2 \end{aligned}$$

Multiply by  $(1-i)$ :  $(1-i)/(1+i) = (1-i)/2$

$$\begin{aligned} 4 \quad & 2 / (1-i) \\ & = 1 + i \end{aligned}$$

Multiply by  $(1+i)$ :  $2(1+i)/2 = 1+i$

$$\begin{aligned} 5 \quad & (2+i) / (2-i) \\ & = (3+4i) / 5 \end{aligned}$$

Num:  $(2+i)^2=3+4i$ ; Den:  $4+1=5$

$$\begin{aligned} 6 \quad & (1+2i) / (1-2i) \\ & = (-3+4i) / 5 \end{aligned}$$

Num:  $(1+2i)^2=-3+4i$ ; Den:  $1+4=5$

$$\begin{aligned} 7 \quad & 5 / (2+i) \\ & = (10-5i) / 5 = 2-i \end{aligned}$$

$5(2-i)/(4+1) = (10-5i)/5 = 2-i$

$$\begin{aligned} 8 \quad & (3-i) / (3+i) \\ & = (4-3i) / 5 \end{aligned}$$

Num:  $(3-i)^2=8-6i \rightarrow$  actually  $(3-i)(3-i)=9-6i-1=8-6i \dots$  use  $(3-i)(3-i)/(9+1)$

$$\begin{aligned} 9 \quad & i / (1+i) \\ & = (1+i) / 2 \end{aligned}$$

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

$$\begin{aligned} 10 \quad & (2+3i) / i \\ & = 3 - 2i \end{aligned}$$

Multiply by  $-i/i$ :  $(2+3i)(-i)/1 = -2i-3i^2 = 3-2i$