

Precalc

Name:

Practice with A2 3.4, 3.5 (division only)

A2 3.5: Divide these numbers. Make sure the answer is in  $a + bi$  form.

$$1. \frac{8}{1+i} \cdot \frac{1-i}{1-i} = \frac{8-8i}{2}$$

$$= 4-4i$$

1	i
1	i
-i	1

$$5. \frac{2+5i}{5+2i} \cdot \frac{5-2i}{5-2i} = \frac{20+21i}{29} = \frac{20}{29} + \frac{21}{29}i$$

2	5i
5	25i
-2i	-4i

5	2i
25	10i
-2i	-10i
	4

$$2. \frac{2i}{1-i} \cdot \frac{1+i}{1+i} = \frac{2i-2}{2}$$

$$= -1+i$$

1	-i
1	-i
i	1

$$6. \frac{-7+6i}{9-4i} \cdot \frac{9+4i}{9+4i} = \frac{-87+26i}{97}$$

$$= \frac{-87}{97} + \frac{26}{97}i$$

-7	6i
9	54i
4i	-28i
	-24

9	-4i
81	-36i
4i	36i
	16

$$3. \frac{-5-3i}{4i} \cdot \frac{i}{i} = \frac{-5i+3}{-4}$$

$$= -\frac{3}{4} + \frac{5}{4}i$$

$$7. \frac{\sqrt{10}}{\sqrt{10}-i} \cdot \frac{\sqrt{10}+i}{\sqrt{10}+i} = \frac{10+\sqrt{10}i}{11}$$

$\sqrt{10}$	-i
10	$-\sqrt{10}i$
i	1

$$= \frac{10}{11} + \frac{\sqrt{10}}{11}i$$

$$4. \frac{3+i}{3-i} \cdot \frac{3+i}{3+i} = \frac{8+6i}{10} = \frac{4}{5} + \frac{3}{5}i$$

3	i
9	3i
3i	-1

3	i
9	3i
-i	-3i
	1

$$8. \frac{6-i\sqrt{2}}{6+i\sqrt{2}} \cdot \frac{6-i\sqrt{2}}{6-i\sqrt{2}} = \frac{34-12i\sqrt{2}}{38}$$

$$= \frac{17}{19} - \frac{6\sqrt{2}}{19}i$$

6	$-i\sqrt{2}$
36	$-6i\sqrt{2}$
$-i\sqrt{2}$	$-6i\sqrt{2}$
	-2

6	$i\sqrt{2}$
36	$6i\sqrt{2}$
$-i\sqrt{2}$	$-6i\sqrt{2}$
	2

see following pages for worked-out solutions

Find the roots of each function using the quadratic formula. Rewrite the function in factored form, like  $f(x) = a(x - \#)(x - \#)$ .

1.  $f(x) = x^2 + 6x + 58$

roots:  $-3 \pm 7i$

$f(x) = (x + 3 - 7i)(x + 3 + 7i)$

5.  $f(x) = 8x^2 + 4x + 5$

roots:  $-\frac{1}{4} \pm \frac{3}{4}i$

$f(x) = 8(x + \frac{1}{4} - \frac{3}{4}i)(x + \frac{1}{4} + \frac{3}{4}i)$

2.  $f(x) = 2x^2 + x + 1$

roots:  $-\frac{1}{4} \pm \frac{\sqrt{7}}{4}i$

$f(x) = 2(x + \frac{1}{4} - \frac{\sqrt{7}}{4}i)(x + \frac{1}{4} + \frac{\sqrt{7}}{4}i)$

6.  $f(x) = 9x^2 - 12x + 85$

roots:  $\frac{2}{3} \pm 3i$

$f(x) = 9(x - \frac{2}{3} - 3i)(x - \frac{2}{3} + 3i)$

3.  $f(x) = 6x^2 - 8x + 3$

roots:  $\frac{2}{3} \pm \frac{\sqrt{2}}{6}i$

$f(x) = 6(x - \frac{2}{3} - \frac{\sqrt{2}}{6}i)(x - \frac{2}{3} + \frac{\sqrt{2}}{6}i)$

7.  $f(x) = x^2 + 4x + 20$

roots:  $-2 \pm 4i$

$f(x) = (x + 2 - 4i)(x + 2 + 4i)$

4.  $f(x) = x^2 - 2x - 4$

roots:  $1 \pm \sqrt{5}$

$f(x) = (x - 1 - \sqrt{5})(x - 1 + \sqrt{5})$

8.  $f(x) = x^2 - 8x + 35$

roots:  $4 \pm \sqrt{19}i$

$f(x) = (x - 4 - \sqrt{19}i)(x - 4 + \sqrt{19}i)$

$$\textcircled{1} \quad a=1, b=6, c=58$$

$$\frac{-6 \pm \sqrt{6^2 - 4 \cdot 1 \cdot 58}}{2 \cdot 1}$$

$$= \frac{-6 \pm \sqrt{-196}}{2}$$

$$= \frac{-6 \pm 14i}{2}$$

$$= -3 \pm 7i$$

$$f(x) = (x - (-3 + 7i))(x - (-3 - 7i)) \\ = (x + 3 - 7i)(x + 3 + 7i)$$

$$\textcircled{2} \quad a=2, b=1, c=1$$

$$\frac{-1 \pm \sqrt{1^2 - 4 \cdot 2 \cdot 1}}{2 \cdot 2}$$

$$= \frac{-1 \pm \sqrt{-7}}{4}$$

$$= \frac{-1 \pm i\sqrt{7}}{4}$$

$$= -\frac{1}{4} \pm \frac{\sqrt{7}}{4}i$$

$$f(x) = 2(x - (-\frac{1}{4} + \frac{\sqrt{7}}{4}i))(x - (-\frac{1}{4} - \frac{\sqrt{7}}{4}i)) \\ = 2(x + \frac{1}{4} - \frac{\sqrt{7}}{4}i)(x + \frac{1}{4} + \frac{\sqrt{7}}{4}i)$$

$$\textcircled{5} \quad a=8, b=4, c=5$$

$$\frac{-4 \pm \sqrt{4^2 - 4 \cdot 8 \cdot 5}}{2 \cdot 8}$$

$$= \frac{-4 \pm \sqrt{-144}}{16}$$

$$= \frac{-4 \pm 12i}{16}$$

$$= -\frac{1}{4} \pm \frac{3}{4}i$$

$$f(x) = 8(x - (-\frac{1}{4} + \frac{3}{4}i))(x - (-\frac{1}{4} - \frac{3}{4}i)) \\ = 8(x + \frac{1}{4} - \frac{3}{4}i)(x + \frac{1}{4} + \frac{3}{4}i)$$

$$\textcircled{6} \quad a=9, b=-12, c=85$$

$$\frac{12 \pm \sqrt{(-12)^2 - 4 \cdot 9 \cdot 85}}{2 \cdot 9}$$

$$= \frac{12 \pm \sqrt{-2916}}{18}$$

$$= \frac{12 \pm 54i}{18}$$

$$= \frac{2}{3} \pm 3i$$

$$f(x) = 9(x - (\frac{2}{3} + 3i))(x - (\frac{2}{3} - 3i)) \\ = 9(x - \frac{2}{3} - 3i)(x - \frac{2}{3} + 3i)$$

$$\textcircled{3} \quad a=6, b=-8, c=3$$

$$\frac{8 \pm \sqrt{(-8)^2 - 4 \cdot 6 \cdot 3}}{2 \cdot 6}$$

$$= \frac{8 \pm \sqrt{-8}}{12}$$

$$= \frac{8 \pm 2i\sqrt{2}}{12}$$

$$= \frac{2}{3} \pm \frac{\sqrt{2}}{6}i$$

$$f(x) = 6 \left( x - \left( \frac{2}{3} + \frac{\sqrt{2}}{6}i \right) \right) \left( x - \left( \frac{2}{3} - \frac{\sqrt{2}}{6}i \right) \right)$$

$$= 6 \left( x - \frac{2}{3} - \frac{\sqrt{2}}{6}i \right) \left( x - \frac{2}{3} + \frac{\sqrt{2}}{6}i \right)$$

$$\textcircled{7} \quad a=1, b=4, c=20$$

$$\frac{-4 \pm \sqrt{4^2 - 4 \cdot 1 \cdot 20}}{2 \cdot 1}$$

$$= \frac{-4 \pm \sqrt{-64}}{2}$$

$$= \frac{-4 \pm 8i}{2}$$

$$= -2 \pm 4i$$

$$f(x) = (x - (-2 + 4i))(x - (-2 - 4i))$$

$$= (x + 2 - 4i)(x + 2 + 4i)$$

$$\textcircled{4} \quad a=1, b=-2, c=-4$$

$$\frac{2 \pm \sqrt{(-2)^2 - 4 \cdot 1 \cdot (-4)}}{2 \cdot 1}$$

$$= \frac{2 \pm \sqrt{20}}{2}$$

$$= \frac{2 \pm 2\sqrt{5}}{2}$$

$$= 1 \pm \sqrt{5}$$

$$f(x) = (x - (1 + \sqrt{5}))(x - (1 - \sqrt{5}))$$

$$= (x - 1 - \sqrt{5})(x - 1 + \sqrt{5})$$

$$\textcircled{8} \quad a=1, b=-8, c=35$$

$$\frac{8 \pm \sqrt{(-8)^2 - 4 \cdot 1 \cdot 35}}{2 \cdot 1}$$

$$= \frac{8 \pm \sqrt{-76}}{2}$$

$$= \frac{8 \pm 2i\sqrt{19}}{2}$$

$$= 4 \pm i\sqrt{19}$$

$$f(x) = (x - (4 + i\sqrt{19}))(x - (4 - i\sqrt{19}))$$

$$= (x - 4 - i\sqrt{19})(x - 4 + i\sqrt{19})$$