

7, 15, ; 21 ; 29, 35,

$$\#7 \left(\frac{\sqrt{2}}{2} + i \right) - \left(\frac{\sqrt{3}}{2} - i \right)$$

$$\left(\frac{\sqrt{2}}{2} - \frac{\sqrt{3}}{2} \right) + \underbrace{i - (-i)}$$

$$\boxed{\frac{\sqrt{2} - \sqrt{3}}{2} + 2i}$$

#15

$$(\sqrt{3} + i)(\sqrt{3} - i)$$
$$3 - i\sqrt{3} + i\sqrt{3} - i^2$$
$$3 - (-1)$$
$$3 + 1$$
$$4$$

$$\#21 \quad (-i)^{107} = -(i^{107}) = -(i^3) = -(-i) = i$$

$$107 \div 4 = 21 \text{ r } 3$$

$$\#29 \quad \frac{1}{i(4+5i)} = \frac{1}{4i + 5i^2} = \frac{1}{-5+4i} \cdot \frac{-5-4i}{-5-4i} = \frac{-5-4i}{(-5)^2 + 4^2}$$

$$= \frac{-5-4i}{25+16} = \frac{-5-4i}{41}$$

$$= \frac{-\frac{5}{41} - \frac{4}{41}i}{1}$$

#35

$$\frac{3-i}{3i} \cdot \frac{i}{3+i} - \frac{3+i}{4+i} \cdot \frac{4-i}{4-i}$$

$$\frac{3i - \overset{-1}{\textcircled{2}}}{9+1} - \frac{12 - 3i + 4i - \overset{-1}{\textcircled{2}}}{4^2 + i^2}$$

$$\frac{1+3i}{10} - \frac{13+i}{17}$$

$$\frac{1}{10} + \frac{3}{10}i - \left(\frac{13}{17} + \frac{1}{17}i \right)$$

$$= \frac{17}{17 \cdot 10} \left(\frac{1}{10} - \frac{13}{17} \right) + \frac{17}{17 \cdot 10} \left(\frac{3}{10} - \frac{1}{17} \right) i$$

$$= \frac{17-130}{170} + \frac{51-10}{170} i$$

$$\boxed{-\frac{113}{170} + \frac{41}{170}i}$$

#34

$$\frac{1}{2-i} + \frac{3+i}{2+3i}$$

$$\frac{71}{65} - \frac{22}{65}i$$

#59

$$3x^2 - 2x + 5 = 0$$

$$a = 3$$

$$b = -2$$

$$c = 5$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{2 \pm \sqrt{4 - 4(3)(5)}}{2(3)}$$

$$56 = 4 \cdot 14$$

$$\frac{2 \pm \sqrt{4 - 60}}{6}$$

$$\frac{2 \pm \sqrt{-56}}{6}$$

$$\frac{2 \pm i\sqrt{56}}{6}$$

$$\frac{2}{6} \pm \frac{\sqrt{56}}{6}i$$

$$x = \frac{1}{3} \pm \frac{2\sqrt{14}}{6}i$$

$$x = \frac{1}{3} \pm \frac{\sqrt{14}}{3}i$$



$$67. \quad x^3 - 8 = 0$$

$$x^3 - 2^3 = 0$$

$$(x-2)(x^2+2x+4) = 0$$

$$x-2=0 \rightarrow \boxed{x=2}$$

$$x^2+2x+4=0$$

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

$$x = \frac{-2 \pm \sqrt{4-16}}{2}$$

$$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$$

$$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

$$x = \frac{-2 \pm \sqrt{-12}}{2}$$

$$x = \frac{-2}{2} \pm \frac{i\sqrt{12}}{2} = -1 \pm i\sqrt{3}$$

$$\boxed{x = -1 \pm i\sqrt{3}}$$

$$x^4 - 16 = (x^2 - 4)(x^2 + 4)$$
$$(x - 2)(x + 2)(x^2 + 4)$$

$$x^2 + 4 = 0$$

$$x^2 = -4$$

$$x = \pm \sqrt{-4}$$

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

$$x = \pm 2i$$

$$x = 2$$

$$x = -2$$

#55

$$\textcircled{3x} + \underline{4i} = \textcircled{6} + 2yi$$

$$3x = 6$$

$$\boxed{x = 2}$$

$$-4i = 2yi$$

$$\boxed{-2 = y}$$

#27

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

$$= \frac{12-15i}{4^2+5^2}$$

$$\frac{12-15i}{16+25}$$

$$\textcircled{\frac{12}{41}} + \textcircled{-\frac{15}{41}i}$$

$a + bi$

$$x^3 - 1 = 0$$

$x = 1$ is a solution

$$(1^3 - 1 = 0)$$

1	1	0	0	-1
	↓	1	1	1
	1	1	1	0

$$x^2 + x + 1 = 0$$

$$x = \frac{-1 \pm \sqrt{1^2 - 4 \cdot 1 \cdot 1}}{2 \cdot 1} = \frac{-1 \pm \sqrt{-3}}{2}$$

$$x = \frac{-1 \pm i\sqrt{3}}{2}$$

$$x = \frac{-1 \pm i\sqrt{3}}{2}$$

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$
$$x^3 - 1^3 = (x - 1)(x^2 + x + 1)$$