Mat 1275 HW11

11.4 Exercises

$\sqrt{32} = \sqrt{16} \cdot \sqrt{2} = 4\sqrt{2}$

1. Simplify $4\sqrt{-32}$.

$$4\sqrt{-32} = 4 \cdot \sqrt{32} \cdot i = 4 \cdot 4\sqrt{2}\, i = \boxed{16\sqrt{2}\, i}$$

$\sqrt{-32} = \sqrt{32} \cdot \sqrt{-1} = \sqrt{32} \cdot i$

2. Write in standard form: $-2 + 6i - (5 + 2i)$.

Sol: $-2 + 6i - (5 + 2i)$

$= -2 + 6i - 5 - 2i$

$= (-2 - 5) + (6i - 2i) = -7 + 4i$

3. Write in standard form: $(-2 + 6i)(5 + 2i)$.

	-2	$+6i$
5	-10	$30i$
$2i$	$-4i$	$12i^2$

$-2 + 6i$

$(-2 + 6i) \cdot (5 + 2i)$

$= -10 - 12 + 30i - 4i$

$= -22 + 26i$

$12 i^2 = 12 \cdot (-1)$

$\qquad = -12$

4. Write in standard form: $\dfrac{-2 + 6i}{-5 - 2i}$.

Sol: standard form: $a + bi$

① Rationalize with the conjugate of $-5 - 2i$:

$(-5 - 2i) \cdot (-5 + 2i) = 25 - 4 + 10i - 10i$

$\qquad\qquad\qquad\qquad = 21$

	-5	$-2i$
-5	25	$10i$
$+2i$	$-10i$	$-4i^2$

$-4i^2 = -4 \cdot (-1) = 4$

② Multiply $(-5+2i)$ on numerator and the denominator:

$$\frac{(-2+6i)\cdot(-5+2i)}{(-5-2i)\cdot(-5+2i)} = \frac{10-12-30i-4i}{21} = \frac{-2-34i}{21}$$

$$= -\frac{2}{21} - \frac{34}{21}i$$

$$\begin{array}{c|c|c}
 & -2+6i & \\
\hline
-5 & 10 & -30i \\
\hline
+2i & -4i & 12i^2 \\
\end{array}$$

$$12i^2 = 12\cdot(-1) = -12$$

5. Solve $x^2 - 5x + 20 = 0$.

By Quadratic formula: $Ax^2+Bx+C=0$ has solutions

$$X = \frac{-B \pm \sqrt{(B)^2 - 4\cdot A\cdot C}}{2\cdot A}$$

$1x^2 - 5x + 20 = 0$

$A=1$, $B=-5$, $C=20$

$$X = \frac{-(-5) \pm \sqrt{(-5)^2 - 4\cdot 1\cdot 20}}{2\cdot 1} \nearrow \begin{array}{c} 25-80 \\ = -55 \end{array}$$

$$= \frac{5 \pm \sqrt{-55}}{2} = \frac{5 \pm \sqrt{55}\, i}{2}$$

6. Solve $3x(x+2) = 2x - 5$.

① "Simplify" on both sides:

$$\Rightarrow 3x^2 + 6x = 2x - 5$$
$$ -2x \quad -2x$$
$$\Rightarrow 3x^2 + 4x = -5$$
$$ +5 \quad +5$$
$$\Rightarrow 3x^2 + 4x + 5 = 0$$

② By Quadratic formula: $Ax^2 + Bx + C = 0$ has solutions

$$X = \frac{-B \pm \sqrt{(B)^2 - 4\cdot A\cdot C}}{2\cdot A}$$

$3x^2 + 4x + 5 = 0$

$A=3$, $B=4$, $C=5$

$$x = \frac{-(4) \pm \sqrt{(4)^2 - 4 \cdot 3 \cdot 5}}{2 \cdot 3} \qquad \rightarrow 16 - 60 = -44$$

$$= \frac{-4 \pm \sqrt{-44}}{6} = \frac{-4 \pm \sqrt{4} \cdot \sqrt{11} \cdot \sqrt{-1}}{6} = \frac{-4 \pm 2\sqrt{11}\, i}{6}$$

$$\Rightarrow x = \frac{2(-2 \pm \sqrt{11}\, i)}{6 \; 3} = \frac{-2 \pm \sqrt{11}\, i}{3}$$