

Adding and Subtracting Complex Numbers
(a) $(7-3 i)+(4+5 i)=$

$$
\begin{gathered}
7+4-3 i+5 i \\
11+2 i \\
a+b i
\end{gathered}
$$

(b) $(2-i)-(8+3 i)=$

$$
\begin{gathered}
2-i-8-3 i \\
-6-4 i
\end{gathered}
$$

Multiplying Complex Numbers
$(2+3 i) \cdot(5-i)=$

$$
\begin{aligned}
& i=\sqrt{-1} \\
& i^{2}=-1 \\
& i^{3}=i^{2}-i \\
& i^{2}=-i \\
& i^{4}=i^{2} \cdot i^{2} \\
& i^{4}=(-1)(-1) \\
& i^{4}
\end{aligned}
$$

Multiplying Complex Numbers

$$
\begin{array}{rl}
(2+3 i) \cdot(5-i)= & 10-2 i+15 i-3 i^{2} \\
& 10+13 i+3 \\
& \\
& =\frac{13}{13}+13 i \\
a & b
\end{array}
$$

Complex Conjugates and Division
DEFINITION Complex Conjugate
The complex conjugate of the complex number $z=a+b i$ is

$$
\bar{z}=\overline{a+b i}=a-b i .
$$

switch sign in the

$$
13+13 i \rightarrow 13-13 i
$$

Dividing Complex Numbers
Write the complex number in standard form.
(a) $\frac{2}{3-i} \cdot \frac{(3+i)}{(3+i)}$
(b) $\frac{(5+i)}{(2-3 i)} \cdot \frac{(2+3 i)}{(2+3 i)}$

$$
\begin{array}{cc}
\frac{6+2 i}{9+3 i-3 i-i^{2}} & \frac{10+15 i+2 i+3 i^{2}}{4-9 i^{2}} \\
\frac{6+2 i}{9+1} \\
\frac{6+2 i}{10}=\frac{3+0 i}{5}+\frac{1}{5} i & \frac{7+17 i}{13}
\end{array}
$$

Solving a Quadratic Equation
Solve $x^{2}+x+1=0$.

$$
\begin{array}{ll}
b^{2}-4 a c & \\
1^{2}-4(1) 1 & x=\frac{-b \pm \sqrt{b^{2}-}}{2 a} \\
\frac{1-4}{-3} & x=\frac{1 \pm \sqrt{-3}}{2} \\
& x=\frac{-1 \pm \sqrt{3} i}{2} \\
& x=-\frac{1}{2} \pm \frac{\sqrt{3}}{2}
\end{array}
$$

