

## Addition and Subtraction of complex numbers

- $(a + bi) + (c + id) = (a + c) + (b + d)i$ .
- $(a + bi) - (c + id) = (a - c) + (b - d)i$ .
- $(3 - 5i) + (6 + 7i) = (3 + 6) + (-5 + 7)i = 9 + 2i$ .
- $(3 - 5i) - (6 + 7i) = (3 - 6) + (-5 - 7)i = -3 - 12i$ .
- $(2 + 3i)(2 - 5i) = 4 - 10i + 6i - 15i^2 = 4 - 4i - 15i^2$

- **Simplify  $(2 - i)(3 + 4i)$ .**

$$\begin{aligned}(2 - i)(3 + 4i) &= (2)(3) + (2)(4i) + (-i)(3) + (-i)(4i) \\ &= 6 + 8i - 3i - 4i^2 = 6 + 5i - 4(-1) \\ &= 6 + 5i + 4 = \mathbf{10 + 5i}\end{aligned}$$

$$\frac{3}{2i} = \frac{3}{2i} \cdot \frac{i}{i} = \frac{3i}{2i^2} = \frac{3i}{2(-1)} = \frac{3i}{-2} = -\frac{3i}{2} = -\frac{3}{2}i$$

$$\frac{1}{4+2i} = \frac{1}{4+2i} \cdot \frac{4-2i}{4-2i} = \frac{4-2i}{16+4} = \frac{4-2i}{20} = \frac{4}{20} - \frac{2}{20}i = \frac{2}{10} - \frac{1}{10}i$$

$$\begin{aligned}(a+bi)(a-bi) &= a^2 - abi + abi - (bi)^2 \\ &= a^2 - b^2(i^2) \\ &= a^2 - b^2(-1) \\ &= a^2 + b^2\end{aligned}$$

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