

$$\textcircled{1} \quad a) \quad (2-3i) - (3+2i) = 2-3i-3-2i =$$

$$= 2-3-3i-2i = \underline{\underline{-1-5i}}$$

$$b) \quad (2-7i) + (5-2i) = 2-7i+5-2i = \underline{\underline{7-9i}}$$

$$c) \quad (8-7i) + (-9+4i) = 8-7i-9+4i = \underline{\underline{-1-3i}}$$

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$$2a \quad \text{Re: } -1 \quad \text{Im: } -5$$

$$b \quad \text{Re: } 7 \quad \text{Im: } -9$$

$$c \quad \text{Re: } -1 \quad \text{Im: } -3$$

$$\textcircled{3} \quad a) \quad 2\left(\frac{3}{4} + \frac{2}{3}i\right) + 3\left(\frac{4}{5} - \frac{5}{6}i\right) =$$

$$= \frac{3}{2} + \frac{4}{3}i + 4 - \frac{15}{6}i =$$

$$= \frac{3}{2} + \frac{8}{2} + i\left(\frac{4}{3} - \frac{15}{6}\right) = \frac{11}{2} + i\left(\frac{8}{6} - \frac{15}{6}\right) =$$

$$= \frac{11}{2} + i\left(-\frac{7}{6}\right) = \frac{11}{2} - \frac{7i}{6}$$

$$b) \quad \frac{2-7i}{5} + \frac{5-2i}{4} = \frac{2}{5} + \frac{5}{4} - i\left(\frac{7}{5} + \frac{2}{4}\right) =$$

$$= \frac{8+25}{20} - i\left(\frac{28+10}{20}\right) = \frac{33}{20} - i\frac{38}{20} =$$

$$= \frac{1}{20}(33-38i)$$

$$c) \quad \frac{\sqrt{3}}{2} - \frac{1}{2}i + \frac{1}{2} + \frac{\sqrt{3}}{2}i =$$

$$= \frac{\sqrt{3}}{2} + \frac{1}{2} + i\left(\frac{\sqrt{3}}{2} - \frac{1}{2}\right) = \frac{1}{2}\left[\sqrt{3}+1 + i(\sqrt{3}-1)\right]$$

$$\textcircled{4} \quad a) \quad (2-3i)(3+2i) = 2 \cdot 3 + 2 \cdot 2i - 3i \cdot 3 - 3i \cdot 2i = \\ = 6 + 4i - 9i - 6i^2 = 6 - 5i + 6 = \underline{12-5i}$$

$$b) \quad (2-7i)(5-2i) = 10 - 4i - 35i - 14 = \underline{-4-39i}$$

$$c) \quad (8-7i)(-9+4i) = -72 + 32i + 63i + 28 = \\ = -44 + 95i$$

$$\textcircled{5} \quad a) \quad (4-3i)(-5-2i) = -20 - 8i + 15i - 6 = \\ = -26 + 7i \quad \text{Re: } -26 \quad \text{Im: } 7$$

$$b) \quad (7-i)(5-2i) = 35 - 14i - 5i - 2 = \\ = 33 - 19i$$

$$\textcircled{6} \quad a) \quad 6\left(\frac{3}{4} - \frac{2}{3}i\right)\left(\frac{4}{3} - \frac{5}{6}i\right) = 6\left(\frac{3}{4} \cdot \frac{4}{3} - \frac{3}{4} \cdot \frac{5}{6}i - \frac{2}{3}i \cdot \frac{4}{3} - \frac{2}{3} \cdot \frac{5}{6}\right) \\ = 6\left(1 - \frac{5}{8}i - \frac{8}{9}i - \frac{10}{18}\right) = 6 - \frac{30}{9} - 6\left(\frac{5}{8} + \frac{8}{9}\right)i \\ = \frac{54-30}{9} - 6i\left(\frac{45+64}{72}\right) = \frac{24}{9} - i \frac{109}{12} \cdot 6 = \\ = \frac{8}{3} - \frac{109}{2}i$$

$$b) \quad \frac{2+6i}{5} \cdot \frac{5-5i}{4} = \frac{(1+3i)(1-3i)}{2} = \frac{1-3i+3i+9}{2} = \\ = \frac{10}{2} = 5$$

$$c) \quad \frac{1}{4}(\sqrt{3}+i)(1+\sqrt{3}i) = \frac{1}{4}(\sqrt{3}+3i+i-\sqrt{3}) = i$$

⑦

$$(a-bi)(a+bi) = a^2 + abi - abi + b^2 = a^2 + b^2$$

$$(a+bi)(a+bi) = a^2 + abi + abi - b^2 = a^2 + 2abi - b^2$$

$$(b-ai)(a-bi) = ab - b^2i - a^2i - ab = -i(a^2 + b^2)$$

$$(b-ai)(a+bi) = ab + b^2i - a^2i + ab = 2ab + i(b^2 - a^2)$$

⑧

$$a) \frac{(a-bi)(a+bi)}{(a+bi)} = a-bi$$

$$b) \frac{2+3i}{3+4i} = \frac{(2+3i)(3-4i)}{9+16} = \frac{6-8i+9i+12}{25} = \frac{18+i}{25}$$

$$c) \frac{4+3i}{3-4i} = \frac{(4+3i)(3+4i)}{9+16} = \frac{12+16i+9i-12}{25} = \frac{25i}{25} = i$$

$$d) \frac{\frac{\sqrt{3}}{2} + \frac{1}{2}i}{\frac{1}{2} + \frac{\sqrt{3}}{2}i} = \frac{\sqrt{3}+i}{1+\sqrt{3}i} = \frac{(\sqrt{3}+i)(1-\sqrt{3}i)}{1+3} =$$

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

$$9 \quad a) (3-7i)^* = 3+7i$$

$$b) (-5-6i)^* = -5+6i$$

$$c) z^* = \frac{(3+3i)^*}{(3-4i)^*} = \frac{3-3i}{3+4i} = \frac{(3-3i)(3-4i)}{9+16} = \frac{1}{25} (9-12i-9i-12) = \frac{-3-21i}{25}$$

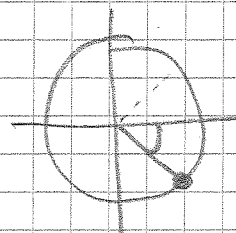
$$\frac{3+3i}{3-4i} = \frac{(3+3i)(3+4i)}{25} = \frac{1}{25} (9+12i+9i-12) = \frac{-3+21i}{25}$$

$$⑩ \quad a) z = 3-7i \quad |z| = \sqrt{9+49} = \sqrt{58}$$

$$b) z = -5-6i \quad |z| = \sqrt{25+36} = \sqrt{61}$$

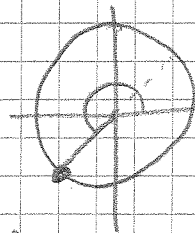
$$c) z = \frac{3+3i}{3-4i} = \frac{|3+3i|}{|3-4i|} = \frac{9+9}{9+16} = \frac{18}{25}$$

$$⑪ \quad a) z = 3-7i \quad \arg z = -\arctan \frac{7}{3}$$



$$b) z = -5-6i$$

$$\arg z = \arctan \frac{6}{5} + \pi$$



$$c) \arg z = \arg(3+3i) - \arg(3-4i) =$$

$$= \arctan \frac{3}{3} - (-\arctan \frac{4}{3}) =$$

$$= \arctan 1 + \arctan \frac{4}{3} =$$

$$= \arctan \frac{4}{3} + \frac{\pi}{4}$$