

$$\textcircled{a} \quad f) \quad \frac{(4-3i)^5 (1-i)^3}{(5\sqrt{3}+5i)^9} \quad (r \text{cis} \theta)^n = r^n \text{cis} n\theta$$

$$a=4 \quad b=-3 \quad (\text{Quad } 4)$$

$$r = \sqrt{16+9} \quad \alpha = \tan^{-1}\left(\frac{3}{4}\right) \quad \theta = 360-36.9 \quad \boxed{5 \text{cis} 323.1^\circ}$$

$$r = \sqrt{25} \quad \alpha = 36.9^\circ \quad \theta = 323.1^\circ$$

$$r = 5$$

$$a=1 \quad b=-1 \quad (\text{Quad } 4)$$

$$r = \sqrt{1+1} \quad \alpha = \tan^{-1}\left(\frac{1}{1}\right) \quad \theta = 360-45 \quad \boxed{\sqrt{2} \text{cis} 315^\circ}$$

$$r = \sqrt{2} \quad \alpha = 45^\circ \quad \theta = 315^\circ$$

$$a=5\sqrt{3} \quad b=5 \quad (\text{Quad } 1)$$

$$r = \sqrt{(5\sqrt{3})^2 + (5)^2} \quad \alpha = \tan^{-1}\left(\frac{5}{5\sqrt{3}}\right) \quad \theta = 30^\circ \quad \boxed{10 \text{cis} 30^\circ}$$

$$r = \sqrt{75+25} \quad \alpha = 30^\circ$$

$$r = 10$$

$$\frac{(5 \text{cis} 323.1^\circ)^5 (\sqrt{2} \text{cis} 315^\circ)^3}{(10 \text{cis} 30^\circ)^9}$$

$$\frac{[5^5 \text{cis}(5 \cdot 323.1)] [\sqrt{2}^3 \text{cis}(3 \cdot 315)]}{10^9 \text{cis}(9 \cdot 30)}$$

$$\frac{(3125 \text{cis} 1615.5^\circ) (2\sqrt{2} \text{cis} 945^\circ)}{100 \text{cis} 60^\circ}$$

$$\frac{6250\sqrt{2} \text{cis} 2560.5^\circ}{100 \text{cis} 60^\circ}$$

$$62.5\sqrt{2} \text{cis} 2500.5^\circ$$

$$\boxed{62.5\sqrt{2} \text{cis} 340.5^\circ}$$

Review:

① a)  $(3-2i)^2 - (2+i)(1-i)$

$$(3-2i)(3-2i) - (2+i)(1-i)$$

$$9 - 12i + 4i^2 - (2 - i - i + i^2)$$

$$9 - 12i - 4 - 2 + i + i \rightarrow -1$$

$$\boxed{2-11i}$$

b)  $2i^3 - i^{12} + 2i^{18} - (3i^3)^3$

$$2i^3 - i^{12} + 2i^{18} - 27i^9$$

$$2(i) - 1 + 2(i^6)(i^3) - 27(i^3)(i)$$

$$-2i - 1 - 2 - 27i$$

$$\boxed{-3-29i}$$

② a)  $x^2 + x + 3 = 0$

$$a=1 \quad x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(3)}}{2(1)}$$

$$b=1$$

$$c=3$$

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

$$x = \frac{-1 \pm \sqrt{-11}}{2}$$

$$x = \frac{-1 \pm i\sqrt{11}}{2}$$

$$\boxed{x = \frac{-1 \pm i\sqrt{11}}{2}}$$

② b)  $x^2 + 2 = 2x$

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

$$a=1 \quad b=-2 \quad c=2$$

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

$$x = \frac{2 \pm \sqrt{4-8}}{2}$$

$$x = \frac{2 \pm 2i}{2}$$

$$\boxed{x = 1 \pm i}$$

## Review

$$\begin{aligned} \textcircled{1} \text{ b) } & 2i^3 - i^{12} + 2i^{18} - (3i^3)^3 \\ & 2i^3 - i^{12} + 2i^{18} - 27i^9 \\ & 2(-i) - (1) + 2(i^6 \cdot i^3) - 27(i^8 \cdot i) \\ & -2i - 1 + 2(-1) - 27(i) \\ & -2i - 1 - 2 - 27i \end{aligned}$$

$$\boxed{-3 - 29i}$$

$$\textcircled{1} \text{ c) } \frac{(1+i)(2-i)}{(-3+2i)}$$

$$\frac{2+i-i^2}{(-3+2i)}$$

$$\frac{(3+i)(-3-2i)}{(-3+2i)(-3-2i)}$$

$$\frac{-9 - 9i - 2i^2}{9 - 4i^2}$$

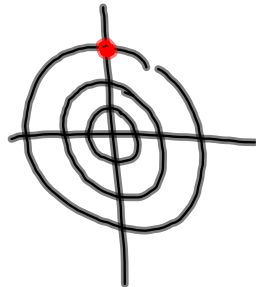
$$\frac{-7-9i}{13} \rightarrow \left( \frac{-7}{13} - \frac{9i}{13} \right)$$

$$\textcircled{4} \text{ b) } (-3, \frac{3\pi}{2})$$

$$\begin{aligned} r &= -3 \\ \theta &= \frac{3\pi}{2} \end{aligned} \cdot (-3, 270^\circ)$$

Convert to Degrees

$$\frac{\cancel{3\pi}}{\cancel{2}} \times \frac{\cancel{180}^{\circ}}{\cancel{\pi}} = 270^\circ$$



Review # 2

$$(r \operatorname{cis} \theta)^n = r^n \operatorname{cis} n\theta$$

① c)  $(\underline{1+i})^{11} (\underline{1-i})^{15}$

a=1  
b=1

a=1  
b=-1

①  $r = \sqrt{1^2 + 1^2}$     ②  $\alpha = \tan^{-1}\left(\frac{1}{1}\right)$     ③ Quad 1    ④  $\underline{\sqrt{2} \operatorname{cis} 45^\circ}$   
 $r = \sqrt{2}$                        $\alpha = 45^\circ$                        $\theta = \alpha$                        $\theta = 45^\circ$

①  $r = \sqrt{1^2 + (-1)^2}$     ②  $\alpha = \tan^{-1}\left(\frac{1}{-1}\right)$     ③ Quad 4    ④  $\underline{\sqrt{2} \operatorname{cis} 315^\circ}$   
 $r = \sqrt{2}$                        $\alpha = 45^\circ$                        $\theta = 360^\circ - 45^\circ$                        $\theta = 315^\circ$

$$(\sqrt{2} \operatorname{cis} 45^\circ)^{11} (\sqrt{2} \operatorname{cis} 315^\circ)^{15}$$

$$(\sqrt{2}^{11} \operatorname{cis} (11 \cdot 45^\circ)) (\sqrt{2}^{15} \operatorname{cis} (15 \cdot 315^\circ))$$

$$(32\sqrt{2} \operatorname{cis} 495^\circ) (128\sqrt{2} \operatorname{cis} 4725^\circ)$$

$$(4096(2) \operatorname{cis} 5220^\circ)$$

$$\boxed{8192 \operatorname{cis} 180^\circ} \text{ Polar}$$

$$\boxed{-8192 + 0i} \text{ Rectangular}$$

Polar  $\rightarrow$  Rectangular  
 $r \operatorname{cis} \theta$                        $a+bi$

①  $a = r \cos \theta$     ②  $b = r \sin \theta$     ③  $a+bi$

① a)  $\boxed{3125 \operatorname{cis} 360^\circ}$  polar form

$$a = 3125 \cos 360$$

$$a = 3125(1)$$

$$a = 3125$$

$$b = 3125 \sin 360$$

$$b = 3125(0)$$

$$b = 0$$

$$3125 + 0i$$

$$\boxed{3125}$$

rectangular  
form

$$\textcircled{1} \text{ b) } \underline{(1-i)}^{10} \quad \begin{matrix} a=1 \\ b=-1 \end{matrix} \quad (r \text{cis} \theta)^n = r^n \text{cis} n\theta$$

$$\textcircled{1} r = \sqrt{(1)^2 + (-1)^2} \quad \textcircled{2} \alpha = \tan^{-1}\left(\frac{-1}{1}\right) \quad \textcircled{3} \text{Quad 4} \quad \textcircled{4} \underline{\sqrt{2} \text{cis} 315}$$

$$r = \sqrt{2} \quad \alpha = 45^\circ \quad \theta = 360 - 45^\circ$$

$$\theta = 315$$

$$(\sqrt{2} \text{cis} 315)^{10}$$

$$\sqrt{2}^{10} \text{cis} (10 \cdot 315)$$

$$32 \text{cis} 3150$$

$$\boxed{32 \text{cis} 270^\circ} \text{ Polar}$$

$$\boxed{0 - 32i} \text{ Rectangular}$$

$$\textcircled{1} e) \frac{(1+i)^2 (1-i\sqrt{3})^3}{(5\sqrt{3}+5i)^2}$$

$$\textcircled{1} r = \sqrt{1^2+1^2} \quad \textcircled{2} \alpha = \tan^{-1}\left(\frac{1}{1}\right) \quad \textcircled{3} \text{Quad 1} \quad \textcircled{4} \sqrt{2} \text{ cis } 45^\circ$$

$$r = \sqrt{2} \quad \alpha = 45^\circ \quad \theta = 45^\circ$$

$$r = \sqrt{2}$$

$$\textcircled{1} r = \sqrt{1^2+(-\sqrt{3})^2} \quad \textcircled{2} \alpha = \tan^{-1}\left(\frac{\sqrt{3}}{1}\right) \quad \textcircled{3} \text{Quad 4} \quad \textcircled{4} 2 \text{ cis } 300^\circ$$

$$r = \sqrt{4} \quad \alpha = 60^\circ \quad \theta = 360^\circ - 60^\circ$$

$$r = 2 \quad \theta = 300^\circ$$

$$\textcircled{1} r = \sqrt{(5\sqrt{3})^2+(5)^2} \quad \textcircled{2} \alpha = \tan^{-1}\left(\frac{5}{5\sqrt{3}}\right) \quad \textcircled{3} \text{Quad 1} \quad \textcircled{4} 10 \text{ cis } 30^\circ$$

$$r = \sqrt{75+25} \quad \alpha = 30^\circ \quad \theta = 30^\circ$$

$$r = 10$$

$$\frac{(\sqrt{2} \text{ cis } 45^\circ)^2 (2 \text{ cis } 300^\circ)^3}{(10 \text{ cis } 30^\circ)^2}$$

$$\frac{[\sqrt{2}^2 \text{ cis } (2 \cdot 45)] [2^3 \text{ cis } (3 \cdot 300)]}{[10^2 \text{ cis } (2 \cdot 30)]}$$

$$\frac{(2 \text{ cis } 90^\circ)(8 \text{ cis } 900^\circ)}{100 \text{ cis } 60^\circ}$$

$$\frac{16 \text{ cis } 990^\circ}{100 \text{ cis } 60^\circ}$$

$$0.16 \text{ cis } 930^\circ$$

$$\boxed{0.16 \text{ cis } 210^\circ} \text{ Polar Form}$$

$$0.16 \cos 210^\circ + 0.16i \sin 210^\circ$$

$$\boxed{-0.138 - 0.08i} \text{ Rectangular Form}$$



