

$$\frac{\pi}{3} \Rightarrow 60^\circ$$

$$2\frac{\pi}{3} \Rightarrow 120^\circ$$

$$10\frac{\pi}{3} \Rightarrow 600^\circ$$

$$\textcircled{1} \cos 3\frac{\pi}{2} + i \sin 3\frac{\pi}{2} = 0 - i$$

$$\textcircled{2} \cos \frac{\pi}{3} + i \sin \frac{\pi}{3} = \frac{1}{2} + \frac{\sqrt{3}}{2}i$$

$$\textcircled{3} \cos \frac{4\pi}{3} + i \sin \frac{4\pi}{3} = -\frac{1}{2} + \frac{\sqrt{3}}{2}i$$

$$\textcircled{4} \cos 10\frac{\pi}{3} + i \sin 10\frac{\pi}{3} = \cos 4\frac{\pi}{3} + i \sin 4\frac{\pi}{3} = -\frac{1}{2} - \frac{\sqrt{3}}{2}i$$

$$2\frac{\pi}{3} \textcircled{2}$$

$$2(60^\circ) = 120^\circ$$

الباقي

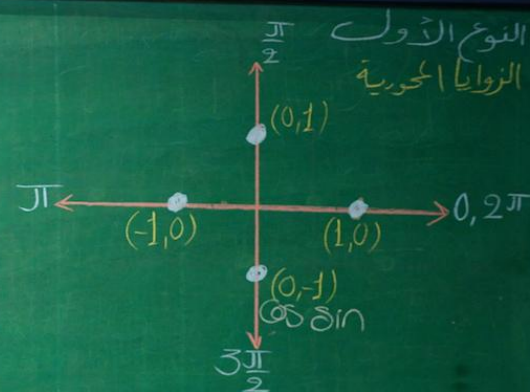
$$\cos \theta \sin \theta$$

$$10\frac{\pi}{3} \textcircled{3}$$

$$10 \div 6 = 1$$

$$4 \text{ باقى}$$

$$4\frac{\pi}{3} = 240^\circ$$



الزوايا الخاصة

النوع الثاني: شكل الزاوية

$$n\frac{\pi}{6}, n\frac{\pi}{4}, n\frac{\pi}{3}$$

أقل من ضعف المقام

النوع الثالث: شكل الزاوية

$$n\frac{\pi}{6}, n\frac{\pi}{4}, n\frac{\pi}{3}$$

أقل من ضعف المقام

③ $(\cos 7\frac{\pi}{12} + i \sin 7\frac{\pi}{12})^{-3}$ 7(45°)

$$= \cos 21\frac{\pi}{12} - i \sin 21\frac{\pi}{12} = 315^\circ$$

↘ 360°
↖ 270°

$$= \cos 7\frac{\pi}{4} - i \sin 7\frac{\pi}{4}$$

$$= \cos \frac{\pi}{4} + i \sin \frac{\pi}{4}$$

$$= \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} i$$

④ $(\cos 5\frac{\pi}{24} + i \sin 5\frac{\pi}{24})^4$ 5(30°) = 150°

$$= \cos 20\frac{\pi}{24} + i \sin 20\frac{\pi}{24}$$

↘ 180°

$$= \cos \frac{\pi}{6} + i \sin \frac{\pi}{6}$$

$$= -\cos \frac{\pi}{6} + i \sin \frac{\pi}{6}$$

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

من / باستناد مبرهنة دي موافر والتعويض:

① $(\cos 3\frac{\pi}{8} + i \sin 3\frac{\pi}{8})^4$

$$= \cos 12\frac{\pi}{8} + i \sin 12\frac{\pi}{8}$$

$$= \cos 3\frac{\pi}{2} + i \sin 3\frac{\pi}{2}$$

$$= 0 - i$$

cos sin
↓ (0, -1)
3π/2

② $(\cos 3\frac{\pi}{8} + i \sin 3\frac{\pi}{8})^{-4}$

$$= \cos 12\frac{\pi}{8} - i \sin 12\frac{\pi}{8}$$

$$= \cos 3\frac{\pi}{2} - i \sin 3\frac{\pi}{2}$$

$$= 0 + i$$

موضوع : مبرهنة دي موافر

① $(\cos \theta + i \sin \theta)^n$

$$= \cos n\theta + i \sin n\theta$$

② $(\cos \theta + i \sin \theta)^{-n}$

$$= \cos n\theta - i \sin n\theta$$

③ $[r(\cos \theta + i \sin \theta)]^n$

$$= r^n (\cos \theta + i \sin \theta)^n$$

$$= r^n (\cos n\theta + i \sin n\theta)$$

④ $[r(\cos \theta + i \sin \theta)]^{-n}$

$$= r^{-n} (\cos \theta + i \sin \theta)^{-n}$$

$$= \frac{1}{r^n} (\cos n\theta - i \sin n\theta)$$

وزارة 2021 الدور الاول

$$\begin{aligned}
 & \textcircled{6} \sqrt{2} \left(\cos 5\frac{\pi}{24} + i \sin 5\frac{\pi}{24} \right)^{-6} \\
 &= \sqrt{2} \left(\cos 30\frac{\pi}{24} - i \sin 30\frac{\pi}{24} \right) \\
 &= \sqrt{2} \left(\cos 5\frac{\pi}{4} - i \sin 5\frac{\pi}{4} \right) \quad \begin{matrix} 5(45^\circ) \\ = 225^\circ \\ \text{ثاني} \end{matrix} \\
 &= \sqrt{2} \left(-\cos \frac{\pi}{4} + i \sin \frac{\pi}{4} \right) \\
 &= \sqrt{2} \left(-\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} i \right) \\
 &= -\frac{\sqrt{2}}{\sqrt{2}} + \frac{\sqrt{2}}{\sqrt{2}} i \\
 &= -1 + i
 \end{aligned}$$

وزارة 2017 الدور الثاني

$$\begin{aligned}
 & \textcircled{5} \left[2 \left(\cos 5\frac{\pi}{4} + i \sin 5\frac{\pi}{4} \right) \right]^7 \\
 &= (2)^7 \left(\cos 5\frac{\pi}{4} + i \sin 5\frac{\pi}{4} \right)^7 \quad \begin{matrix} 32 \\ 35:8=4 \\ 3=\text{الباقى} \end{matrix} \\
 &= 128 \left(\cos 35\frac{\pi}{4} + i \sin 35\frac{\pi}{4} \right) \\
 &= 128 \left(\cos 3\frac{\pi}{4} + i \sin 3\frac{\pi}{4} \right) \quad \begin{matrix} 3(45^\circ) \\ = 135^\circ \\ \text{ثاني} \end{matrix} \\
 &= 128 \left(-\cos \frac{\pi}{4} + i \sin \frac{\pi}{4} \right) \\
 &= 128 \left(-\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} i \right) \\
 &= -\frac{128}{\sqrt{2}} + \frac{128}{\sqrt{2}} i = -\frac{128 \cdot \sqrt{2}}{\sqrt{2} \cdot \sqrt{2}} + \frac{128 \cdot \sqrt{2}}{\sqrt{2} \cdot \sqrt{2}} i \\
 &= -\frac{128\sqrt{2}}{2} + \frac{128\sqrt{2}}{2} i = -64\sqrt{2} + 64\sqrt{2} i
 \end{aligned}$$

موضوع: مبرهنة دي موافر

$$\begin{aligned}
 & \textcircled{1} (\cos \theta + i \sin \theta)^n \\
 &= \cos n\theta + i \sin n\theta \\
 & \textcircled{2} (\cos \theta + i \sin \theta)^{-n} \\
 &= \cos n\theta - i \sin n\theta \\
 & \textcircled{3} [r(\cos \theta + i \sin \theta)]^n \\
 &= r^n (\cos \theta + i \sin \theta)^n \\
 &= r^n (\cos n\theta + i \sin n\theta) \\
 & \textcircled{4} [r(\cos \theta + i \sin \theta)]^{-n} \\
 &= r^{-n} (\cos \theta + i \sin \theta)^{-n} \\
 &= \frac{1}{r^n} (\cos n\theta - i \sin n\theta)
 \end{aligned}$$

$$= 8\sqrt{2}(\cos \frac{\pi}{4} + i \sin \frac{\pi}{4})$$

$$= 8\sqrt{2}(\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} i)$$

$$= \frac{8\sqrt{2}}{\sqrt{2}} + \frac{8\sqrt{2}}{\sqrt{2}} i$$

$$= 8 + 8i$$

وزارة 2010 الدور الأول

في أحسب بأستخدام مبرهنة دي موافر $(1-i)^7$

$$z = 1-i \quad (1, -1)$$

$$r = \|z\| = \sqrt{x^2 + y^2} = (\sqrt{2})$$

$$\cos \theta = \frac{x}{r} = \frac{1}{\sqrt{2}} \quad \theta = \frac{\pi}{4}$$

$$\sin \theta = \frac{y}{r} = \frac{-1}{\sqrt{2}} \quad \text{الدع الرابع}$$

$$\arg(z) = 2\pi - \frac{\pi}{4} = \frac{7\pi}{4}$$

$$Z = (\sqrt{2})^7 (\cos \frac{7\pi}{4} + i \sin \frac{7\pi}{4})^7$$

$$= 8\sqrt{2}(\cos \frac{49\pi}{4} + i \sin \frac{49\pi}{4})$$

$$= 32\sqrt{2}(\cos \frac{11\pi}{4} + i \sin \frac{11\pi}{4})$$

$$= 32\sqrt{2}(\cos \frac{3\pi}{4} + i \sin \frac{3\pi}{4})$$

$$= 32\sqrt{2}(-\cos \frac{\pi}{4} + i \sin \frac{\pi}{4})$$

$$= 32\sqrt{2}(-\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} i)$$

$$= -\frac{32\sqrt{2}}{\sqrt{2}} + \frac{32\sqrt{2}}{\sqrt{2}} i$$

$$= -32 + 32i$$

وزارة 2020 الترميز

في أحسب بأستخدام مبرهنة دي موافر $(1+i)^{11}$

$$z = 1+i \quad (1, 1)$$

$$r = \|z\| = \sqrt{x^2 + y^2} = (\sqrt{2})$$

$$\cos \theta = \frac{x}{r} = \frac{1}{\sqrt{2}} \quad \theta = \frac{\pi}{4}$$

$$\sin \theta = \frac{y}{r} = \frac{1}{\sqrt{2}} \quad \text{الدع الأول}$$

$$\arg(z) = \frac{\pi}{4}$$

$$Z = [\sqrt{2}(\cos \frac{\pi}{4} + i \sin \frac{\pi}{4})]^{11}$$

$$Z = (\sqrt{2})^{11} (\cos \frac{\pi}{4} + i \sin \frac{\pi}{4})^{11}$$