De Moivre's Theorem

https://www.aplustopper.com/de-moivres-theorem/
https://goo.gl/8fzJJr
https://tinyurl.com/ycqp34vz
http://tiny.cc/xk9qqy
http://bit.ly/2DT85DD
http://cutt.us/FJNM1
https://goo.gl/11HRn4
https://goo.gl/uHZvjF
https://sites.google.com/site/aplustoppernotes/de-moivre-s-theorem
https://goo.gl/BFFGNh
http://cbsetuts.blogspot.in/2018/02/de-moivres-theorem.html
https://goo.gl/M9NKcK

(1) If n is any rational number, then $(\cos\theta + i\sin\theta)^n = \cos n\theta + i\sin n\theta$.

De Moivre's Theorem

$$\boxed{\begin{array}{c}(\cos\theta + i\sin\theta)^n = \cos n\theta + i\sin n\theta \\ \text{for all integers } n\end{array}}$$

this extends to;

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

e.g. $(1-i)^5$

$$|z| = \sqrt{1^2 + (-1)^2}$$
$$= \sqrt{2}$$
$$\arg z = \tan^{-1}\left(\frac{-1}{1}\right)$$
$$= -\frac{\pi}{4}$$

(2) If $z = (\cos\theta_1 + i\sin\theta_1)(\cos\theta_2 + i\sin\theta_2)(\cos\theta_3 + i\sin\theta_3)\ldots\ldots\ldots\ldots(\cos\theta_n + i\sin\theta_n)$
then $z = \cos(\theta_1 + \theta_2 + \theta_3 + \ldots\ldots\ldots + \theta_n) + i\sin(\theta_1 + \theta_2 + \theta_3 + \ldots\ldots\ldots + \theta_n)$
where $\theta_1 + \theta_2 + \theta_3 + \ldots\ldots\ldots + \theta_n \in R$.

Read more about De Moivre's Theorem