جامعة المستقبل
AL MUSTAQBAL UNIVERSITY

كلية العلوم
قسم الادلة الجنائية

Lecture (3)

Examples on Limit in Complex Functions

المادة : Complex Analysis

المرحلة : الثانية

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Al-Mustaqbal University
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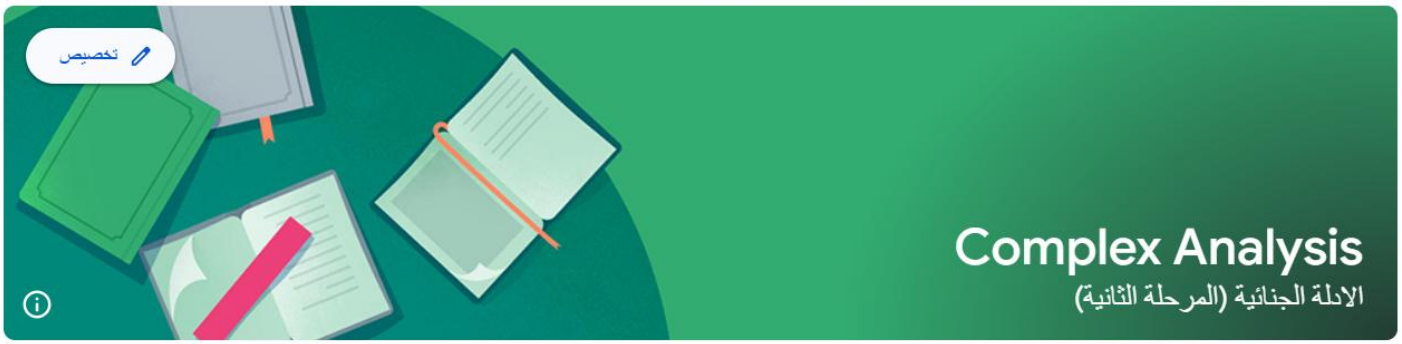
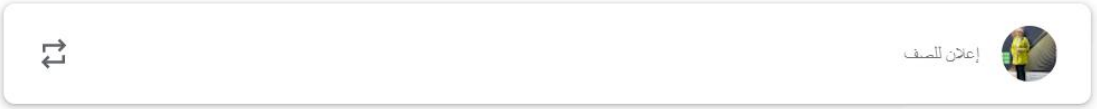
Second Stage





vsp2rqlb

https://classroom.google.com/c/ODE1MDM4MzAxMzU0?cjc=vsp2rqlb

Example 1:

Check weather $\lim_{z\to -1} \frac{z^2+1}{z+2}$ exist or not.

Solution:

$$\lim_{z\to -1} \frac{z^2+1}{z+2} = \frac{(-1)^2+1}{-1+2} = 2 \qquad (\therefore \textit{Lim exist})$$

Example 2:

Check weather $\lim_{z\to 0} \frac{\bar{z}}{z}$ exist or not.

Solution:

$$\lim_{z\to 0} \frac{\bar{z}}{z} = \frac{x-iy}{x+iy}$$

1. $\lim_{z\to 0} \frac{\bar{z}}{z} = \frac{x-0}{x+0} = \frac{x}{x} = 1$

2. $\lim_{z\to 0} \frac{\bar{z}}{z} = \frac{0-iy}{0+iy} = \frac{-iy}{iy} = -1$

$x \neq y \qquad \therefore \textit{Lim dose not exist}$

Question 1: Check weather $\lim_{z\to 0} \frac{x^2-y^2}{x^2+y^2}$ exist or not. Where $z \neq 0$

Example 3: Check if $\lim_{z\to 2}\frac{z+1}{z-1}$ exist or not.

Solution:

$$\lim_{z\to 2}\frac{z+1}{z-1}=\frac{2+1}{2-1}$$

$$=\frac{3}{1}$$

$$=3$$

$\therefore$ *Lim exist*

Example 4: Check if $\lim_{z\to i}\frac{z^2+1}{z-i}$ exist or not.

Solution:

$$\lim_{z\to i}\frac{(i)^2+1}{i-i}=\frac{0}{0}$$

$$=\lim_{z\to i}\frac{z^2+4}{z-2i}$$

$$=\lim_{z\to i}\frac{(z+i)(z+i)}{z-i}$$

$$=\lim_{z\to i}(z+i)$$

$$= \lim_{z \to i}(i + i)$$

$$= 2i$$

$\therefore$ *Lim exist*

Question 2: Check if $\lim_{z \to 3i} \frac{z^2+9}{z-3i}$ exist or not.

Question 3: Check if $\lim_{z \to 5i} \frac{z^2+25}{z-5i}$ exist or not.

Example 5: Check if $\lim_{z \to 0} \frac{x^2 y}{x^4+y^2}$ exist or not.

Solution:

Let y=mx^2

$$\lim_{x \to 0} \frac{x^2(mx^2)}{x^4+(mx^2)^2}$$

$$= \lim_{x \to 0} \frac{mx^4}{x^4(1+m^2)}$$

$$= \lim_{x \to 0} \frac{m}{(1+m^2)}$$

$\therefore$ *Lim does not exist*

Example 6: Check if $\lim_{z\to 0} \frac{2xy^3}{x^2+y^6}$ exist or not.

Solution:

Let $x=my^3$

$$\lim_{x\to 0} \frac{2(my^3)(y^3)}{(my^3)^2+y^6}$$

$$= \lim_{x\to 0} \frac{2my^6}{y^6(m^2+1)}$$

$$= \lim_{x\to 0} \frac{2m}{(m^2+1)}$$

$\therefore$ *Lim does not exist*

Question 4: Check if $\lim_{z\to 2i} \frac{z^2+4}{z^3+8i}$ exist or not. Use L'Hopital Role

Example 7: Check if $\lim_{z\to 1+i} \frac{z^2+(1+i)}{z^3-(1+i)}$ exist or not.

$$\frac{d}{dz}\frac{z^2+(1+i)}{z^3-(1+i)} = \frac{2z}{3z^2}$$

$$= \lim_{z\to 1+i} \frac{2}{3z}$$

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

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

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

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

$\therefore$ *Limit exist*

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THANK YOU

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التغذية الراجعة