Section 14.2 - Limits & Continuity

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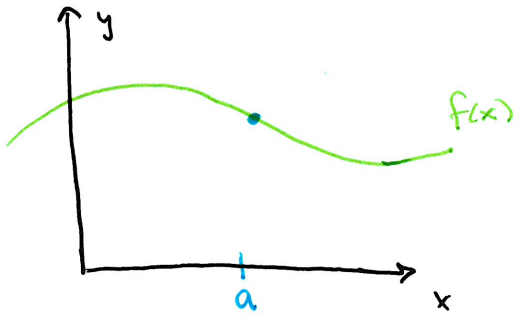
2D Limits:

$\lim_{x \to a} f(x) = L$

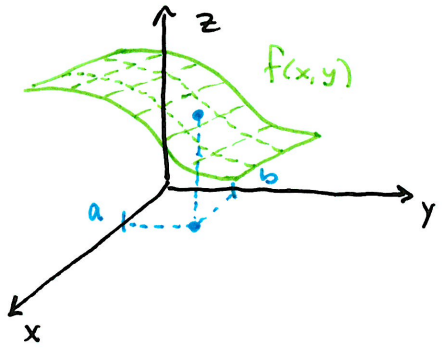


To Exist:

- Definition:

3D Limits:

$\lim_{(x,y) \to (a,b)} f(x,y) = L$



To Exist:

- Definition

Example 1 Show that $\lim_{(x,y) \to (0,0)} \frac{x^2 - y^2}{x^2 + y^2}$ DNE.

Example 3 Show that $\lim_{(x,y) \to (0,0)} \frac{xy^2}{x^2 + y^4}$ DNE.

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Example 4 Find $\lim_{(x,y)\to(0,0)} \frac{3x^2y}{x^2+y^2}$ if it exists.

- Continuous at (a,b):

- Continuous on D:

Theorem $\lim_{(x,y)\to(a,b)} x = a$ $\lim_{(x,y)\to(a,b)} y = b$ $\lim_{(x,y)\to(a,b)} c = c$

Corollary All polynomials of two variables are continous.

Example 8 Is $f(x,y) = \begin{cases} \frac{3x^2y}{x^2+y^2} & \text{if } (x,y) \neq (0,0) \\ 0 & \text{if } (x,y) = (0,0) \end{cases}$ Continous?

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- Extra Examples:

9 $\lim_{(x,y)\to(0,0)} \dfrac{x^4 - 4y^2}{x^2 + 2y^2}$

13 $\lim_{(x,y)\to(0,0)} \dfrac{xy}{\sqrt{x^2+y^2}}$

39 $\lim_{(x,y)\to(0,0)} \dfrac{x^3+y^3}{x^2+y^2}$

40 $\lim_{(x,y)\to(0,0)} (x^2+y^2)\ln(x^2+y^2)$