Question#38671, Math, Calculus

Find the limit if it exist. If it does not exist explain why.

Two questions

1

Limit of cot x

As x approaches pi

and

2

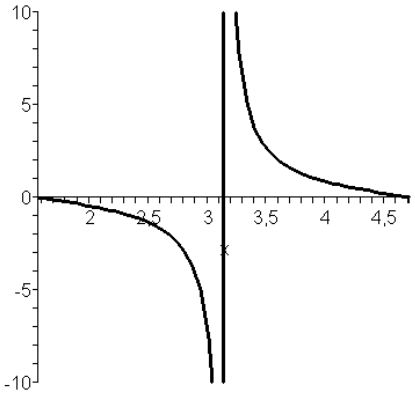
Limit of (2 - absolute(-x))

As x approaches 3

I have the answers from the book but dont understand what process I need to get there. #1 doesnt exist but my in my calc it looks like its 18.something. #2 I substitued in the 3 but get -1 but it aso doesnt exist somehow.

Solution

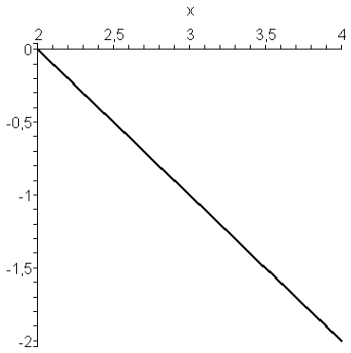
1. We start from an informal definition. The function $f(x)$ is said to have the limit l as x approaches (or tends to) a if the values of $f(x)$ can be made as close as we like to l by taking x sufficiently close to a. If we scetch the cot x graph on the segment $[\pi/2, 3\pi/2]$ we must conclude that this function has no limit as x approaches π in the sense of previous definition, because the graph has a vertical asymptote when $x = \pi/2$.



The function cot x values cannot group around any number near the point $x = \pi$, but if x tends to π then cos x tends to 1 ($\cos x \approx 1$), and sin x tends to 0, so the fraction cos x/sin x = tends to infinity and we can write

$$\lim_{x \to \pi} \cot x = \infty.$$

2. It is also useful to scetch the function graph on the segment [2, 4].



From this graph one can see that the function $2 - |-x|$ approaches –1 as *x* approaches 3. It is easy to explain. We have $|-x| = |x|$, if $x \geq 2$, then $|x| = x$, and by using the well known limit theorems we obtain

$$\lim_{x\to 3}(2 - |-x|) = \lim_{x\to 3}(2 - x) = \lim_{x\to 3} 2 - \lim_{x\to 3} x = 2 - 3 = -1.$$