Matlab For Limit and Continuity

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Definition (Limit of A function)

A finite number L is said to be a limit of a function at a point a if the value of $f(x)$ tends to L as a goes very very close to a. This is written as

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

Some basic codes thst used in limit are given below:

Mathematical Operation	**MATLAB Command**
$lim_{x \to 0} f(x)$	$\lim(f)$
$lim_{x \to a} f(x)$	$\lim(f, x, a)$ or $\lim(f, a)$
$lim_{x \to a^-} f(x)$	$\lim(f, x, a, `left')$
$lim_{x \to a^+} f(x)$	$\lim(f, x, a, `right')$

Some other basic codes:

Mathematical Symbol	**MATLAB Command**
π	pi
$\frac{\pi}{2}$	$pi/2$
e^x	$\exp(x)$
$\lvert x \rvert$	abs (x)
$\sqrt{(x)}$	$\text{sqrt}(x)$

1.Calculate $\lim_x \to 0 \frac{(x^3+5)}{x^4+7}$ using MATLAB.

Answer

The Matlab code is :

```
syms x
limit((x^3 + 5)/(x^4 + 7))
```

This gives answer= $\frac{5}{7}$.

2. Evaluate $\lim_{x\to\infty} \frac{1}{x}$

Its code is

```
syms x
limit(1/x,x,inf)
```

ans= 0

3. Find the left and write hand limit of $\lim_{x\to 2}(\frac{|x-2|}{x-2})$ using matlab.

for LHL

```
syms x
limit(abs(x-2)/(x-2),x,2,'left')
```

=-1.

for RHL

```
syms x
limit(abs(x-2)/(x-2),x,2,'right')
```

=1.

Here LHL $\neq$ RHL so limit does not exist.

4. Find the limit of $\lim_{x\to 5}(\frac{x-5}{|x-2|})$ using matlab.

```
syms x
limit(abs(x-2)/(x-2),x,2,'right')
```

=NAN (this means Not A Number). So the limit does not exist.

5. check the continuity of $\begin{cases} 4x+3, for -3 \leq x \leq -1 \\ x, for -1 \leq x \leq 1 \end{cases}$ using matlab.

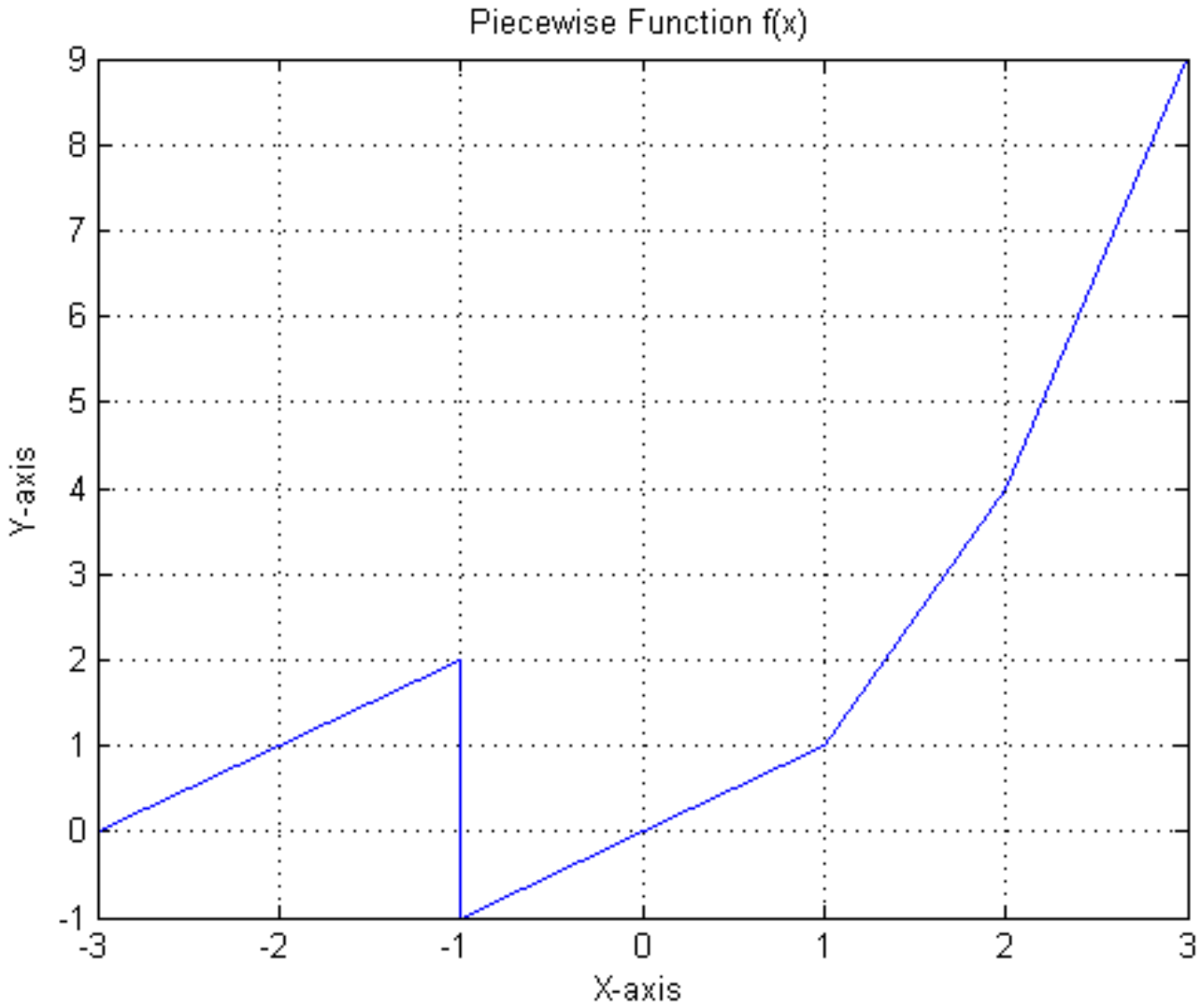
```
x1=-3:1:-1;
eq1 = (4*x1)+3; % Sub-function 1

x2=-1:1:1;
eq2 = x2;       % Sub-function 2



figure
x = [x1 x2];
y = [eq1 eq2];

plot(x, y)
xlabel('X-axis')
ylabel('Y-axis')
title('Piecewise Function f(x)')
grid on;
```



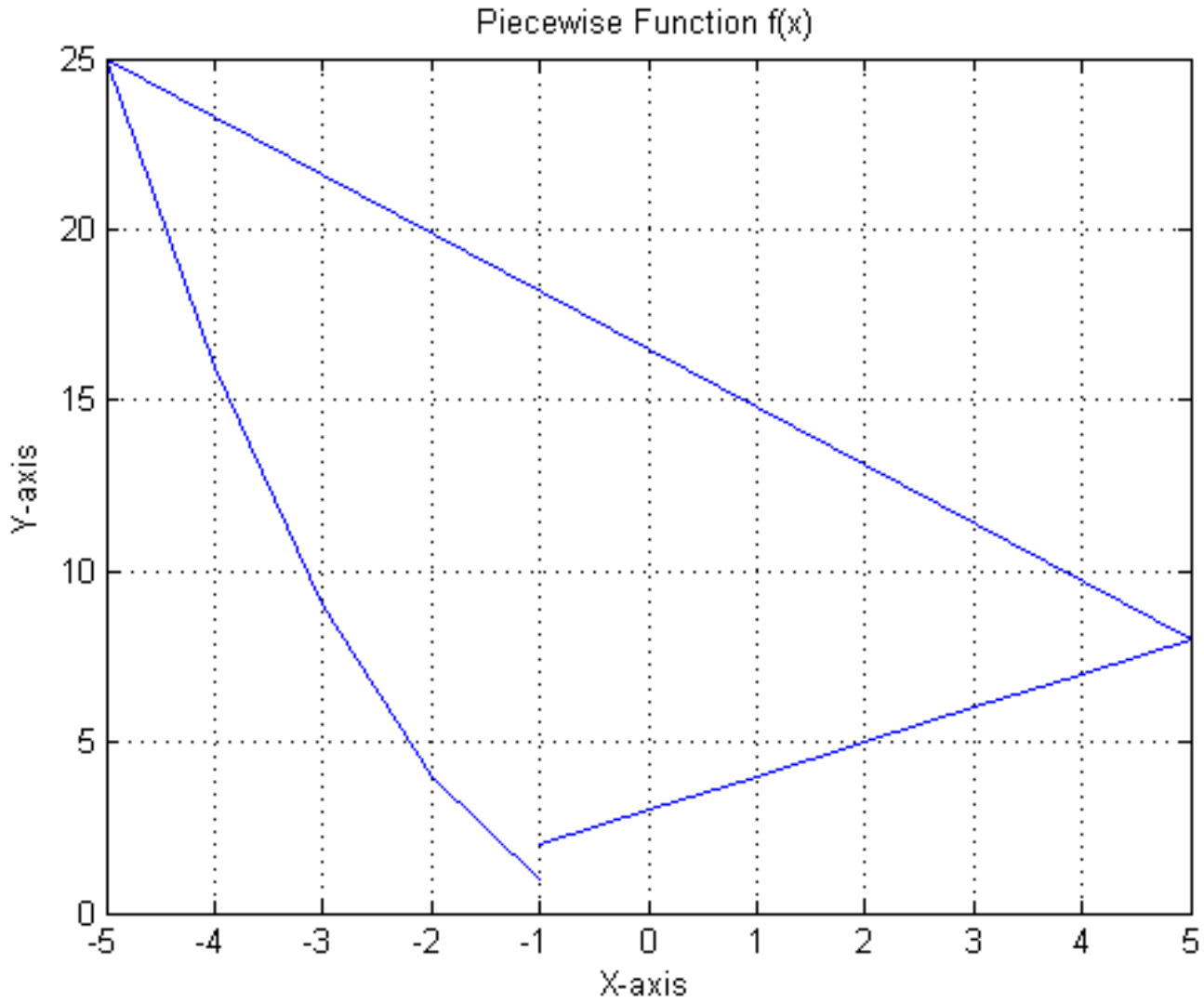
There is no any gap in the curve so it is conuous.

6. check the continuity of $\begin{cases} x+1, for -1 \leq x \leq 5 \\ x, for -5 \leq x \leq 5 \end{cases}$ using matlab at $x = -1$.

```
x1=-1:1:5;
eq1 = x1+3; % Sub-function 1

x2=-5:1:-1;
eq2 = x2.^2;          % Sub-function 2
figure
x = [x1 x2];
y = [eq1 eq2];

plot(x, y)
xlabel('X-axis')
ylabel('Y-axis')
title('Piecewise Function f(x)')
grid on;
```



There is gap in the curve at $x = -1$ so it is not conuous at $x = -1$

THANK YOU