

Real Analysis.Types of discontinuities

i) A function  $f$  is said to have a removable discontinuity at  $x=c$  if  $\lim_{x \rightarrow c} f(x)$  exists but is not equal

to the value  $f(c)$  (which may or may not exist) of the function. Such a discontinuity can be removed by assigning a suitable value to the function at  $x=c$ .

(ii)  $f$  is said to have a discontinuity of the first kind at  $x=c$  if  $\lim_{x \rightarrow c-0} f(x)$  and  $\lim_{x \rightarrow c+0} f(x)$  both exist but are not equal.

(iii)  $f$  is said to have a discontinuity of the first kind from the left at  $x=c$  if  $\lim_{x \rightarrow c-0} f(x)$  exists but is equal to  $f(c)$ .

Discontinuity of the first kind from the right is similarly defined.

(iv)  $f$  is said to have a discontinuity of the 2nd kind at  $x=c$  if neither  $\lim_{x \rightarrow c-0} f(x)$  nor  $\lim_{x \rightarrow c+0} f(x)$  exists.

(v) ~~Discontinuity~~  $f$  is said to have a discontinuity of the 2nd kind from the left at  $x=c$  if  $\lim_{x \rightarrow c-0} f(x)$  does not exist.

Discontinuity of the 2nd kind from the right may be defined similarly.