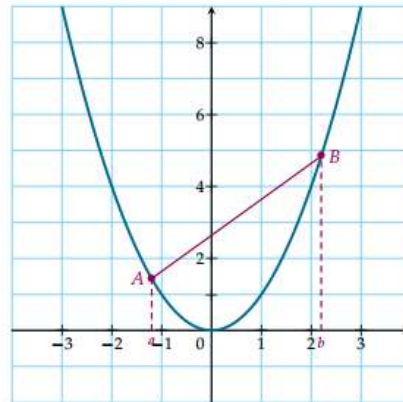


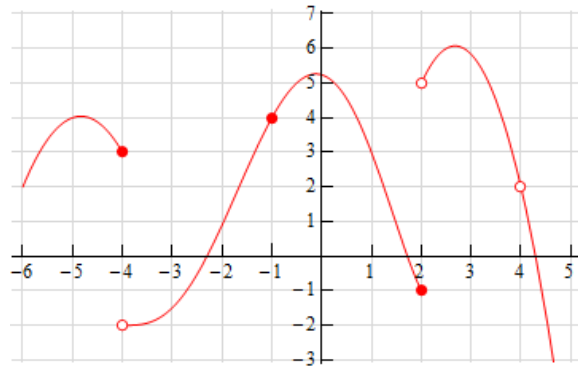
## Continuity

**Continuity:** A function  $f(x)$  is said to be continuous at  $x = a$  if the following conditions are satisfied:

- (i)  $f(a)$  is defined.
- (ii)  $\lim_{x \rightarrow a} f(x)$  exists.
- (iii)  $\lim_{x \rightarrow a} f(x) = f(a)$ .



**Discontinuity:** If one or more of the conditions of the above definition fails to hold,  $f$  has a discontinuity at  $x = a$ .



### **Types of discontinuities:**

- (i) Removable: Left hand limit = Right hand limit =  $L$  but  $f(a) \neq L$ .
- (ii) Jump: Left hand limit  $\neq$  Right hand limit.
- (iii) Infinite or Essential: Either Left hand limit or Right hand limit or both approaches to  $\pm\infty$ .
- (iv) Oscillatory: If a function oscillates at any point finitely or infinitely without approaching any limit.

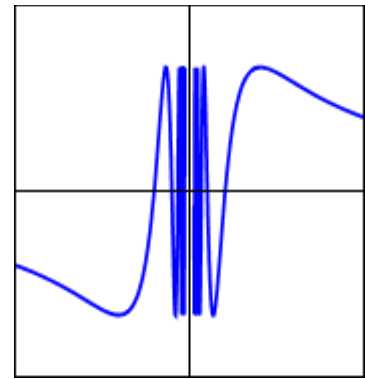
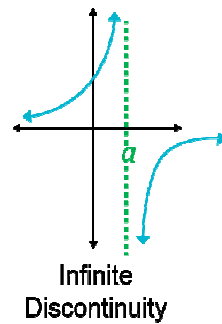
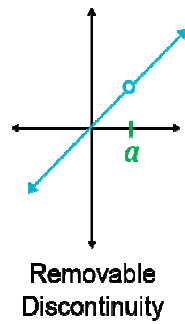
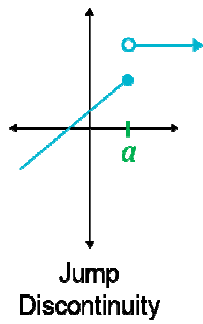


Fig: Oscillatory Discontinuity