AP Calculus AB
Unit 2 – Differentiation
2.2C - PDFs and Differentiability

$f(x)$ is differentiable at a **left end-point** at $x = a$ if:

i) $f(x)$ is continuous from the right.

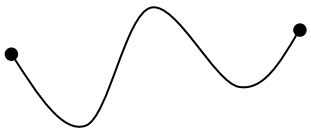
ii) $\lim_{h \to a^+} \frac{f(a+h) - f(a)}{h}$ exists.

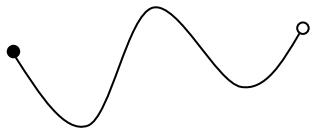
$f(x)$ is differentiable at a **right end-point** at $x = a$ if:

i) $f(x)$ is continuous from the left.

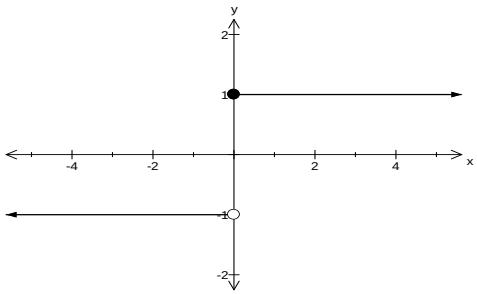
ii) $\lim_{h \to a^-} \frac{f(a+h) - f(a)}{h}$ exists.

e.g.





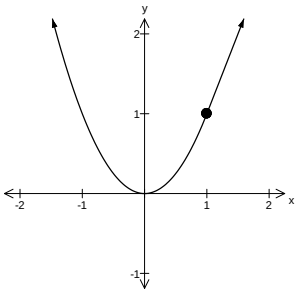
1. Consider the graph of $f(x)$ given below:



Is $f(x)$ left-hand differentiable at $x = 0$?

Is $f(x)$ right-hand differentiable at $x = 0$?

2. Consider $f(x) = \begin{cases} x^2 & ; x \le 1 \\ 2x - 1 & ; x > 1 \end{cases}$ Is $f(x)$ differentiable at $x = 1$?



Check continuity at $x = 1$**:**

Check left-hand derivative at $x = 1$**:**

Check right-hand derivative at $x = 1$**:**

3. Consider $f(x)=\begin{cases} x^2+x\ ;\ x\le 1 \\ 3x-2\ ;\ x>1 \end{cases}$ Is $f(x)$ differentiable at $x=1$?

4. Consider $f(x)=\begin{cases} ax^2-2x\ ;\ x\le 2 \\ 4x+2b\ \ ;\ x>2 \end{cases}$ Determine the values of *a* and *b* that make $f(x)$ differentiable at $x=2$.