DERIVATIVE GRAPHS

Derivative at a point

$$f'(a) = \lim_{x \to a} \frac{f(x) - f(a)}{x - a}$$

DERIVATIVE

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

PROVIDED THAT LIMITS EXISTS.

NOTATIONS OF DERIVATIVE

y' — y prime

$\frac{dy}{dx}$ — "dy dx" → Derivative of y with Respect to x.

$\frac{df}{dx}$ — "df dx" see ABOVE

$\frac{d}{dx} f(x)$ — "d dx of f"

$f'(x)$ — "f prime of x"

Ex! $f(x) = \sqrt{x}$ Differentiate $\boxed{\text{TAKE } f'(x)}$ at point $x=a$

$$f'(a) = \lim_{x \to a} \frac{f(x) - f(a)}{x - a}$$ ← important

$$= \lim_{x \to a} \frac{\sqrt{x} - \sqrt{a}}{x - a} \cdot \frac{\sqrt{x} + \sqrt{a}}{\sqrt{x} + \sqrt{a}}$$

$$= \lim_{x \to a} \frac{\cancel{(x-a)}}{\cancel{(x-a)}(\sqrt{x} + \sqrt{a})} = \lim_{x \to a} \frac{1}{\sqrt{x} + \sqrt{a}}$$

$$= \frac{1}{\sqrt{a} + \sqrt{a}} = \frac{1}{2\sqrt{a}}$$

$$\lim_{x \to a} \frac{f(x) - f(a)}{x - a}$$

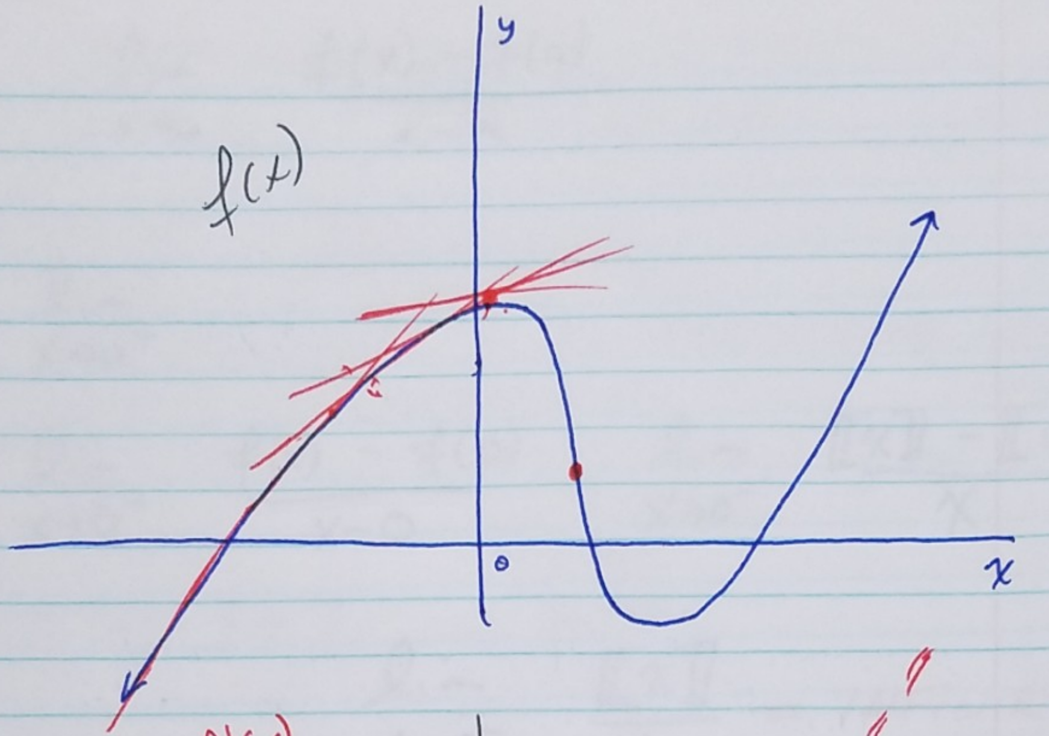
$$\lim_{x \to a^-}$$

$$\lim_{x \to 0^-} \frac{f(x) - f(0)}{x - 0} = \lim_{x \to 0^-} \frac{[\![x]\!] - [\![0]\!]}{x}$$

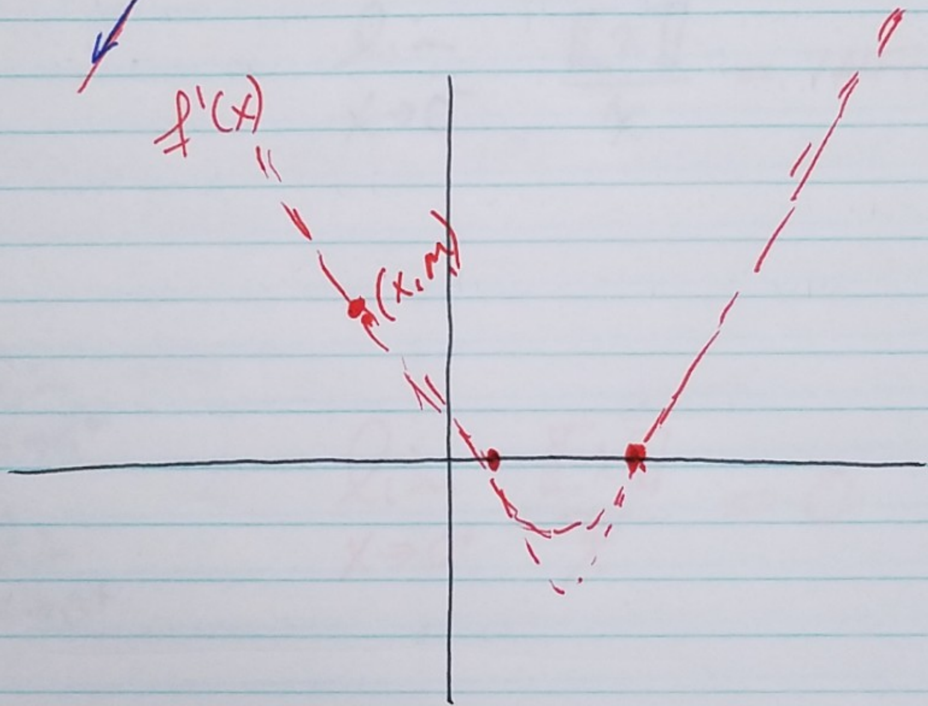
$$\lim_{x \to 0^-} \frac{[\![x]\!]}{x} = \text{INFINITE}$$

$$\lim_{x \to a^+}$$

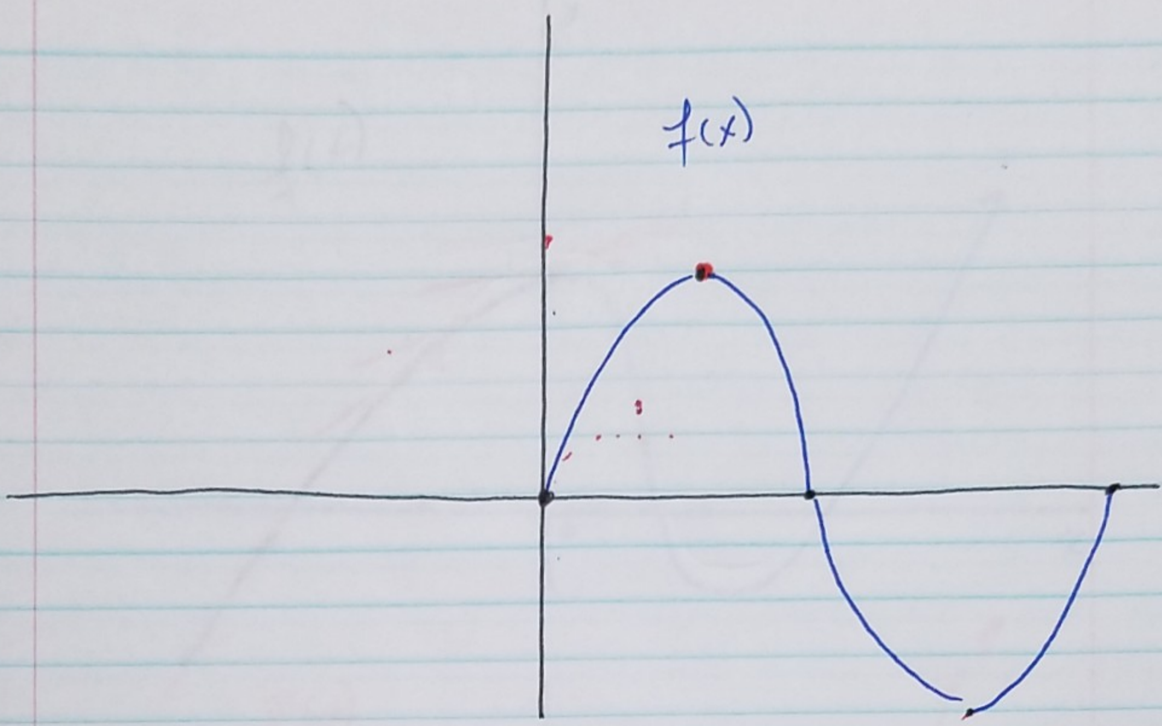
$$\lim_{x \to 0^+} \qquad \lim_{x \to 0^+} \frac{[\![x]\!]}{x} = 0$$

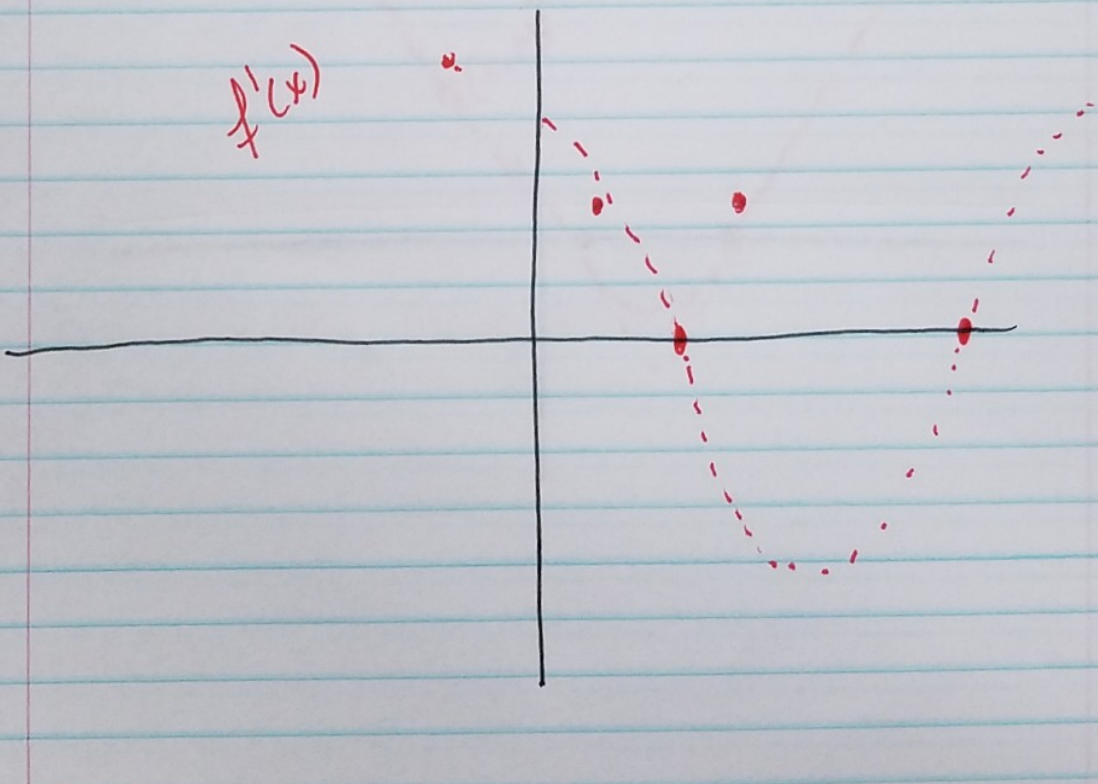


y
f(x)
0
x



f'(x)
(x, m)


f(x)


f'(x)