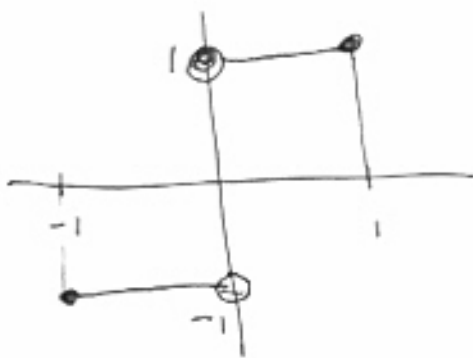


①



The derivative is undefined  
at  $x=0$ .

②

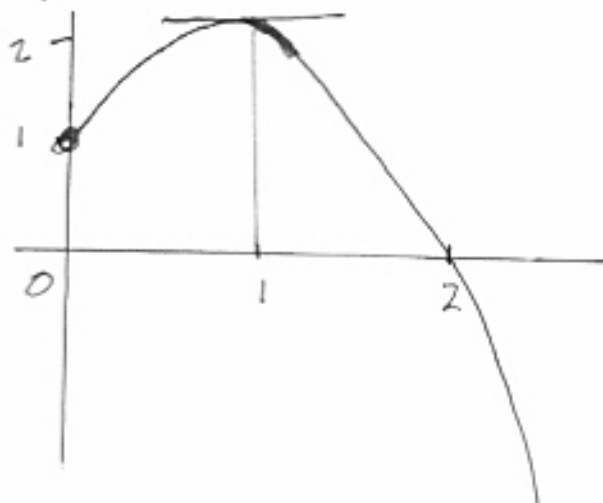
$$(a) \lim_{h \rightarrow 0} \frac{\frac{1}{x+h} - \frac{1}{x}}{h} = \lim_{h \rightarrow 0} \frac{\frac{x - (x+h)}{(x+h)(x)}}{h}$$

$$= \lim_{h \rightarrow 0} \frac{-h}{h(x+h)x} = \lim_{h \rightarrow 0} \frac{-1}{(x+h)x} = -\frac{1}{x^2}$$

$$(b) \lim_{h \rightarrow 0} \frac{(x+h)^3 - x^3}{h} = \lim_{h \rightarrow 0} \frac{x^3 + 3x^2h + 3xh^2 + h^3 - x^3}{h}$$

$$= \lim_{h \rightarrow 0} \frac{h(3x^2 + 3xh + h^2)}{h} = \lim_{h \rightarrow 0} (3x^2 + 3xh + h^2) = 3x^2$$

③ One such graph would be:



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(4) (a)  $\frac{df}{dt} = -gt + v_0$

(b)  $\frac{df}{dt} = 3t^2 + 6t + 3$