



A large, stylized blue graphic on the left side of the slide. It consists of a thick vertical bar with several loops and curves extending from it, resembling a calligraphic flourish or a stylized letter 'F'.

# Functions

Derivation (part 3)



# Solved Exercise

Consider the adjacent curve of a given function  $f$ .

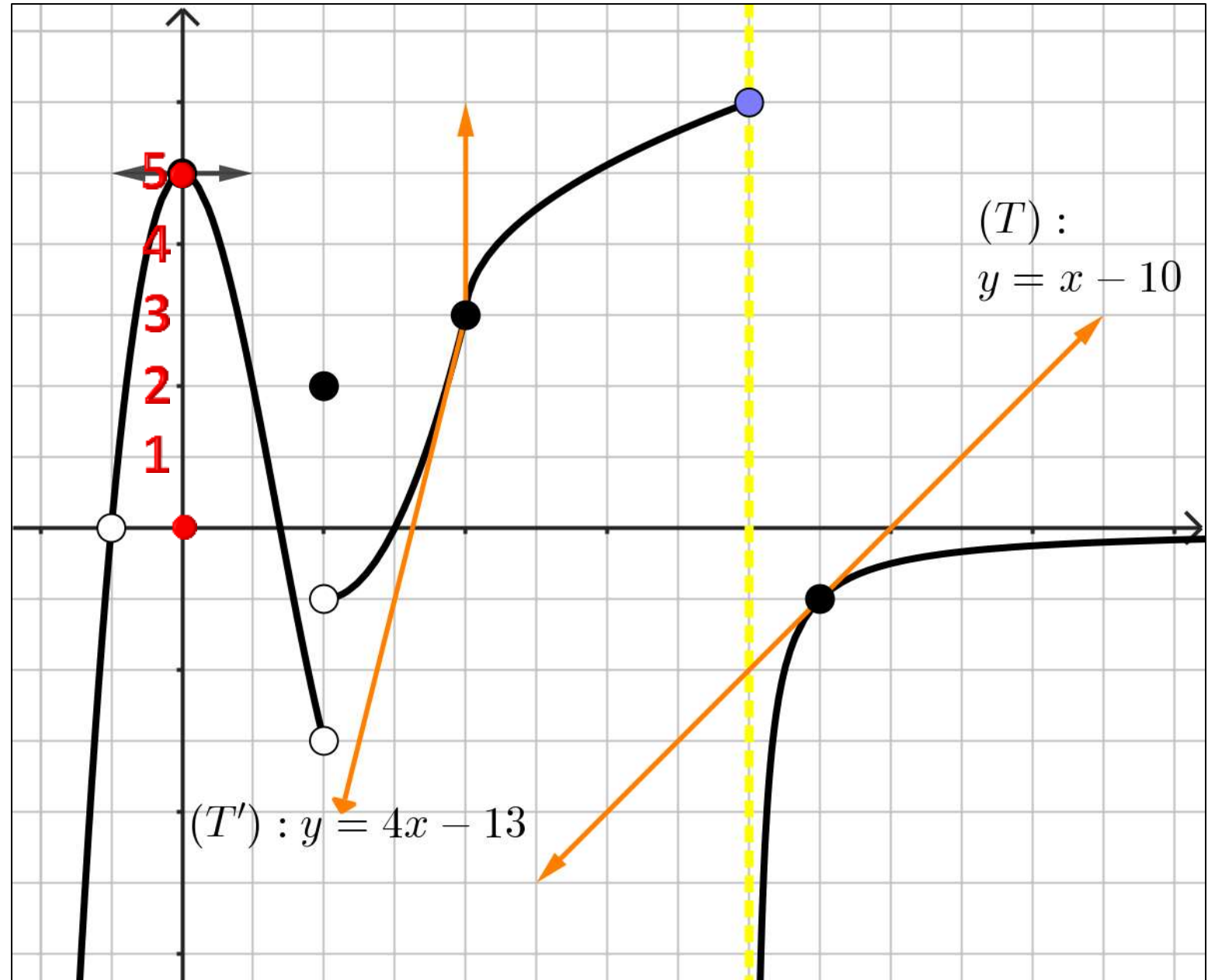
Determine graphically:

a)  $f(0)$

$$f(0)=5$$

b)  $f(2)$

c)  $f(9)$



# Solved Exercise

Consider the adjacent curve of a given function  $f$ .

Determine graphically:

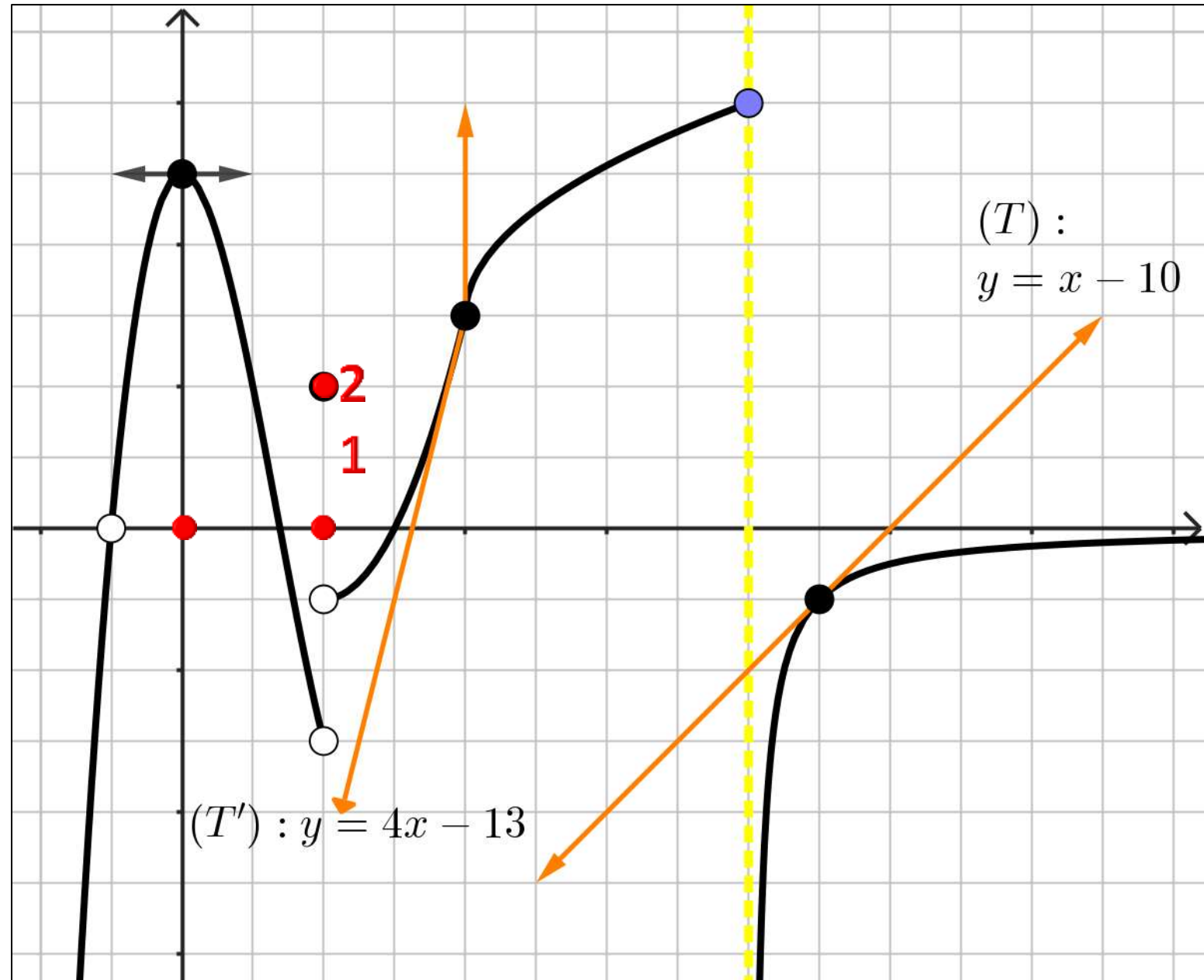
a)  $f(0)$

$$f(0)=5$$

b)  $f(2)$

$$f(2)=2$$

c)  $f(9)$



# Solved Exercise

Consider the adjacent curve of a given function  $f$ .

Determine graphically:

a)  $f(0)$

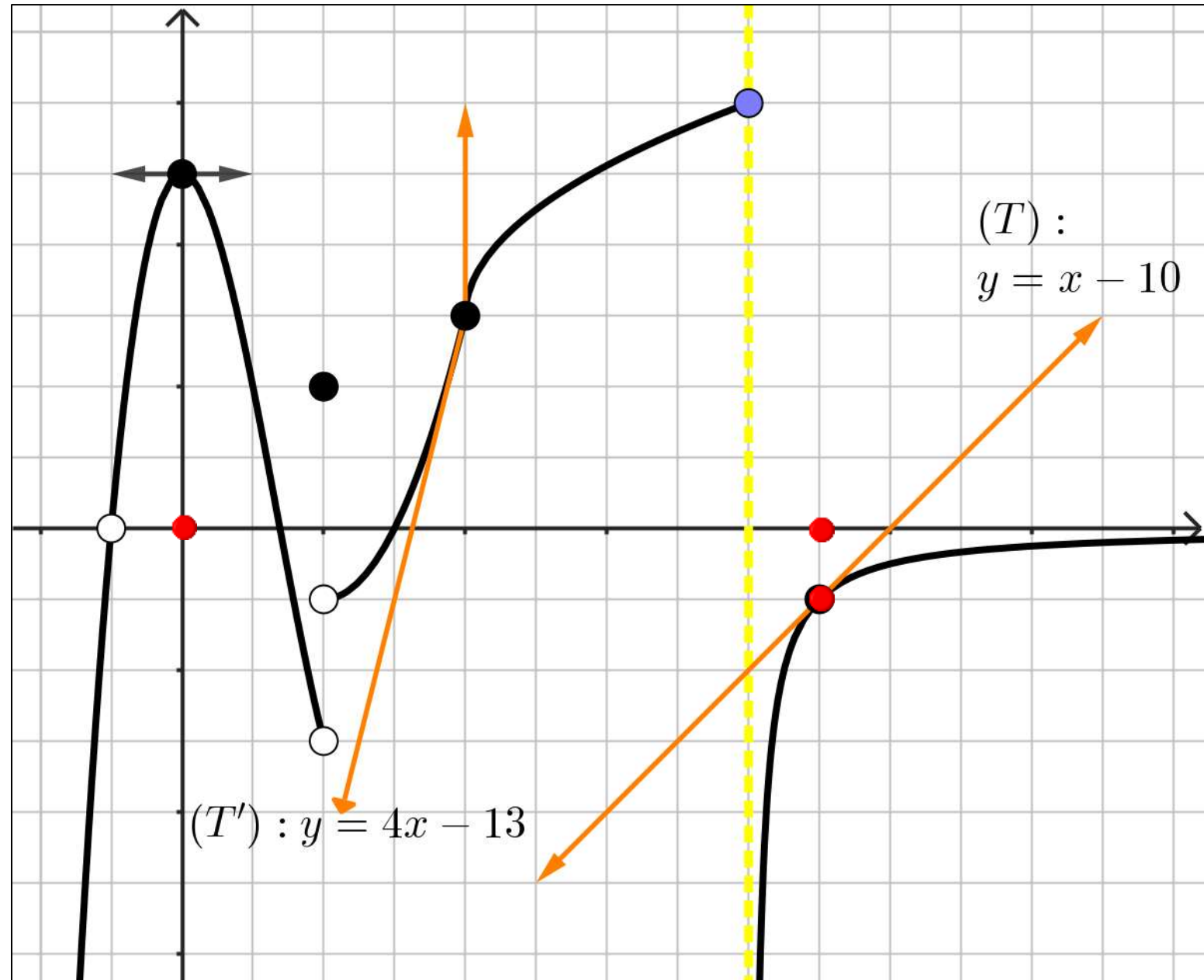
**$f(0)=5$**

b)  $f(2)$

**$f(2)=2$**

c)  $f(9)$

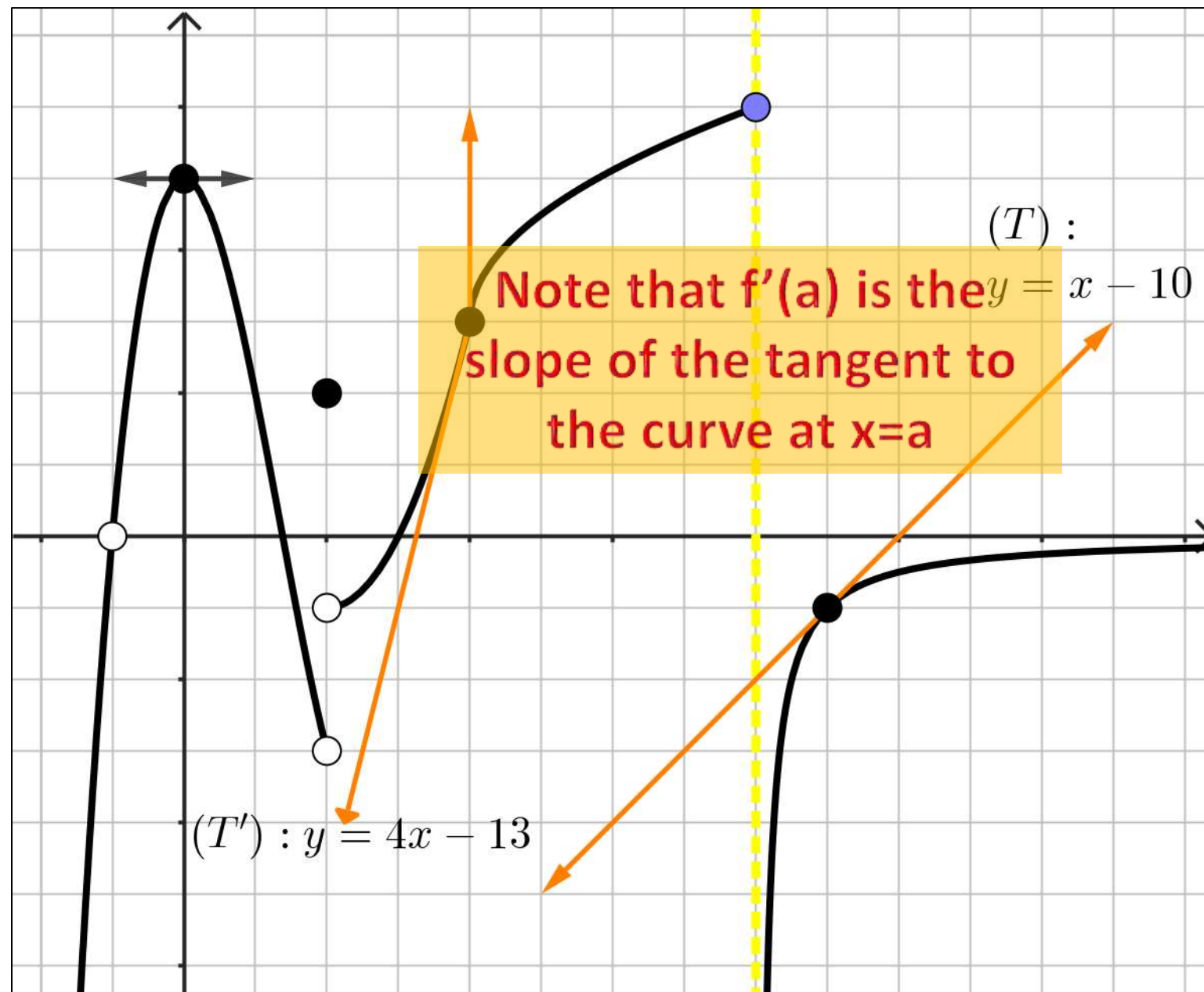
**$f(9)=-1$**



# Solved Exercise

d)  $f'(0)$

e)  $f'(4)$



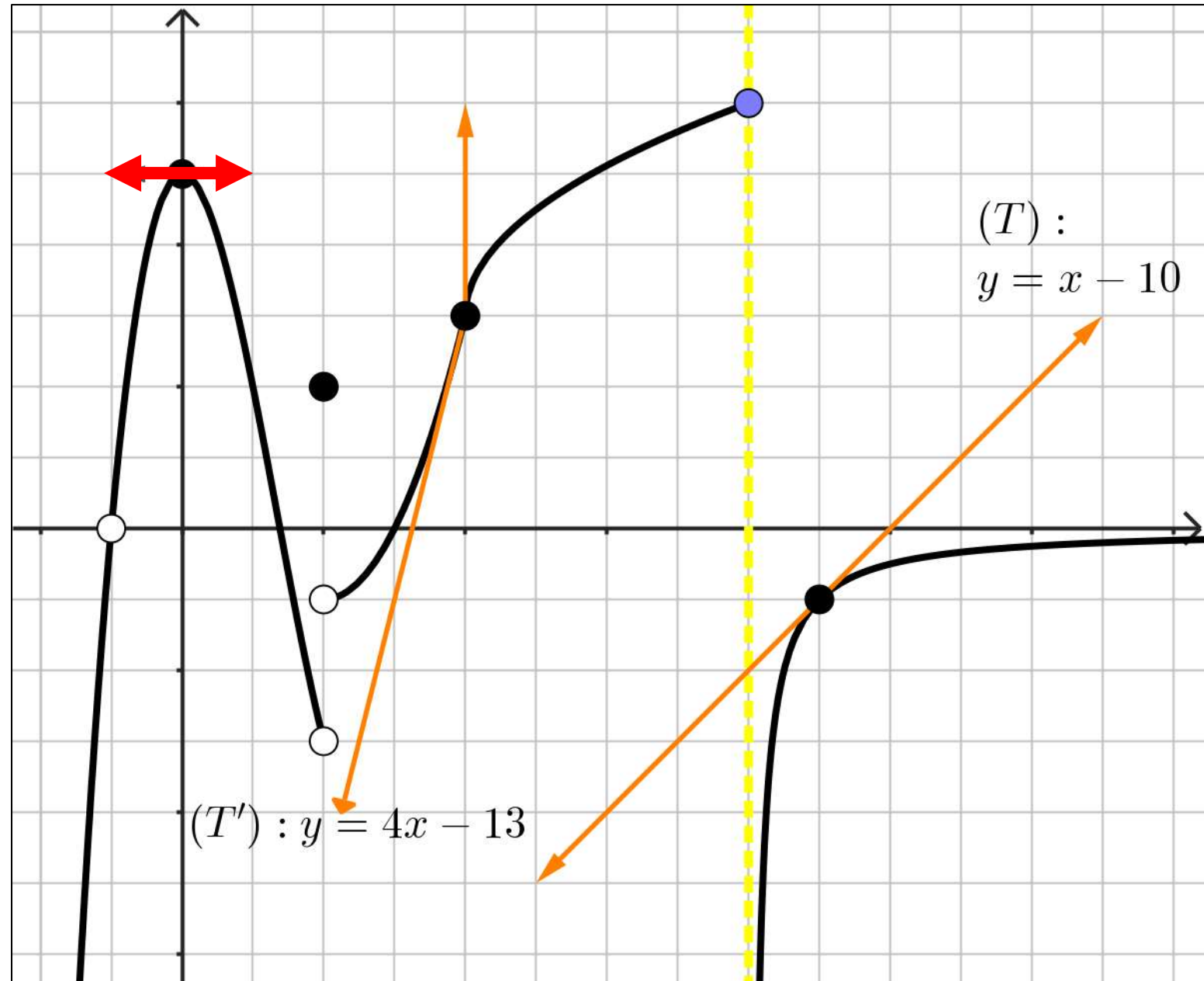
# Solved Exercise

d)  $f'(0)$

horizontal tangent  
of slope 0 so  
 $f'(0)=0$

e)  $f'(4)$

$f'(4)$  doesn't exist  
since there is two  
tangents at  $x=4$  or  
since  $f'_+(4) = +\infty$   
(vertical tangent)





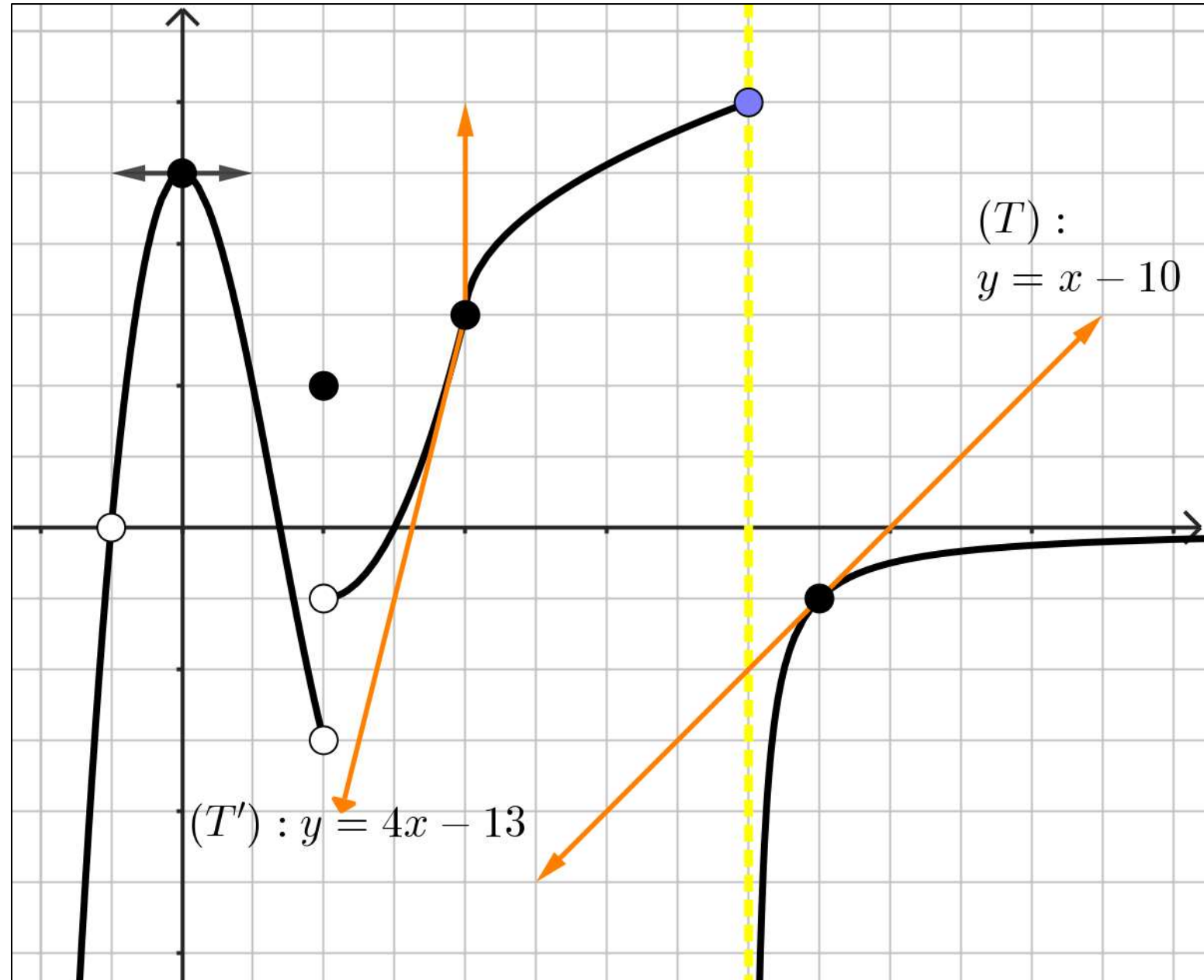
# Solved Exercise

f)  $f'(9)$

**Tangent of slope 1**  
**So  $f'(9)=1$**

g)  $f'(8)$

**$f'(8)$  doesn't exist**  
**since  $f$  is not**  
**continuous at  $x=8$**





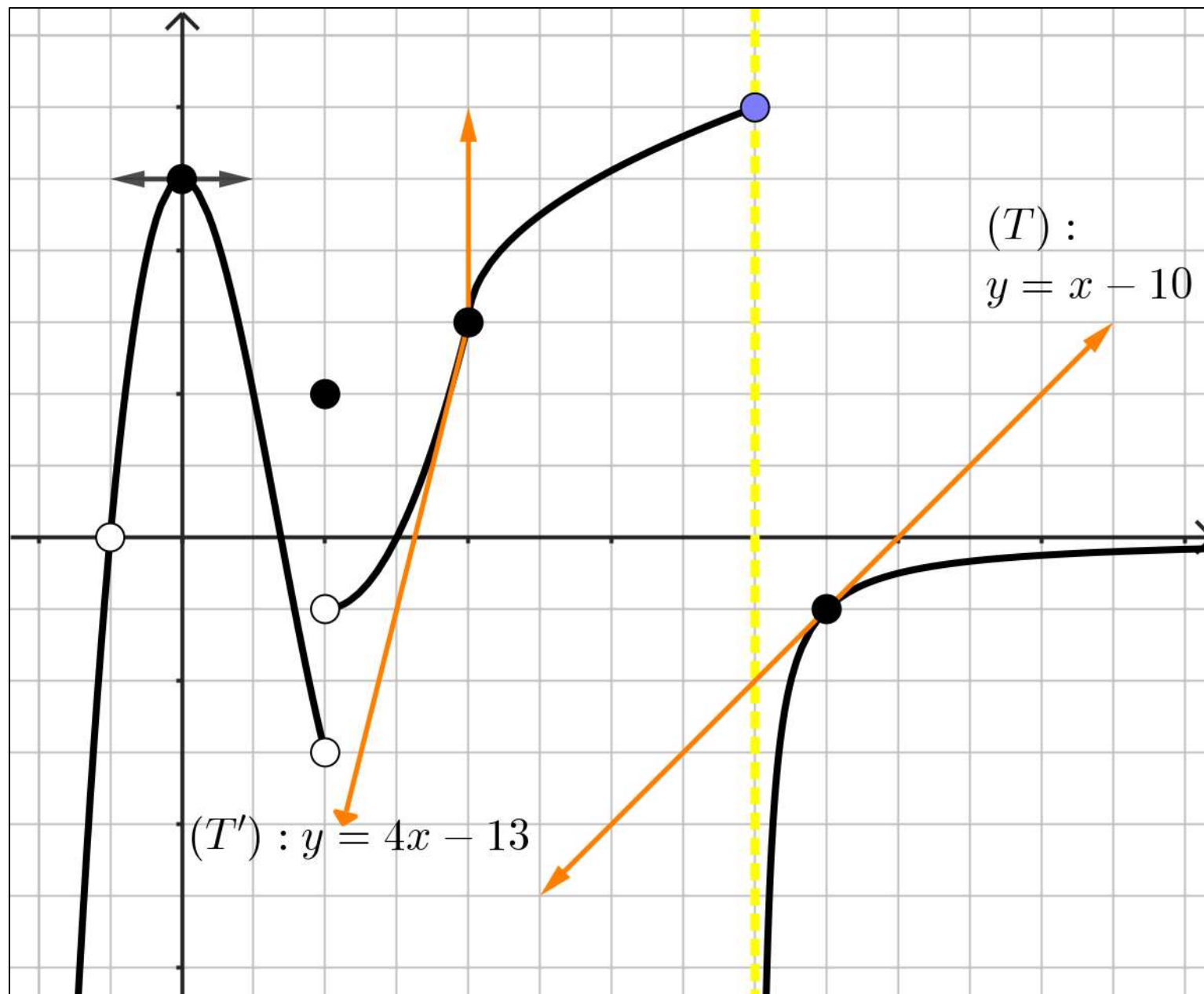
# Solved Exercise

h)  $\lim_{x \rightarrow -\infty} f(x)$

$-\infty$

i)  $\lim_{x \rightarrow +\infty} f(x)$

0



# Solved Exercise

j)  $\lim_{x \rightarrow -1} f(x)$

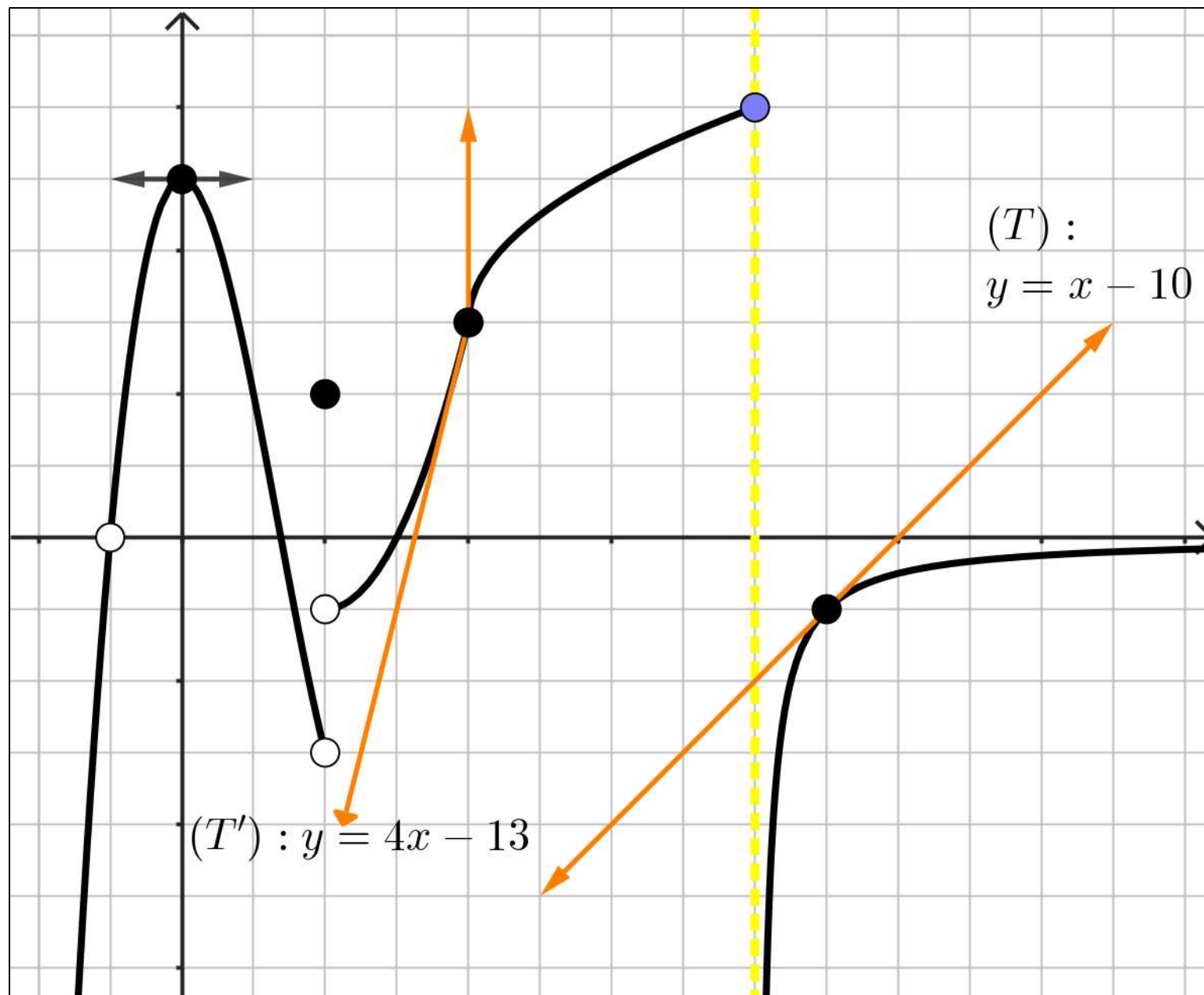
0

k)  $\lim_{x \rightarrow 2} f(x)$

Doesn't exist since

$$\lim_{x \rightarrow 2^-} f(x) = -3$$

$$\lim_{x \rightarrow 2^+} f(x) = -1$$



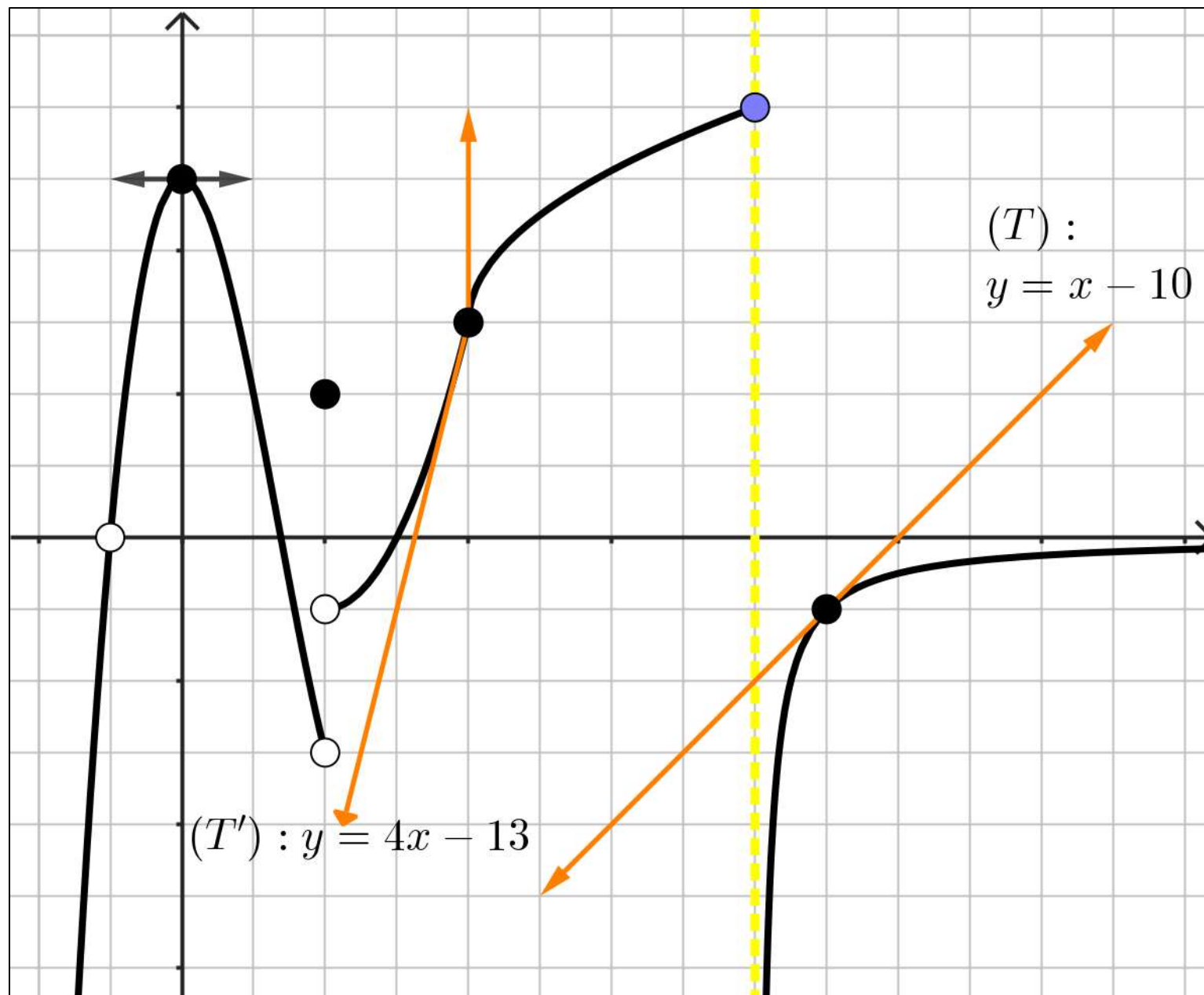
# Solved Exercise

l)  $\lim_{x \rightarrow 8^-} f(x)$

6

m)  $\lim_{x \rightarrow 8^+} f(x)$

$-\infty$



# Solved Exercise

n)  $\lim_{x \rightarrow 9} \frac{f(x)+1}{x-9}$

$$\begin{aligned} & \lim_{x \rightarrow 9} \frac{f(x)+1}{x-9} \\ &= \lim_{x \rightarrow 9} \frac{f(x)-f(9)}{x-9} \\ &= f'(9) = 1 \end{aligned}$$

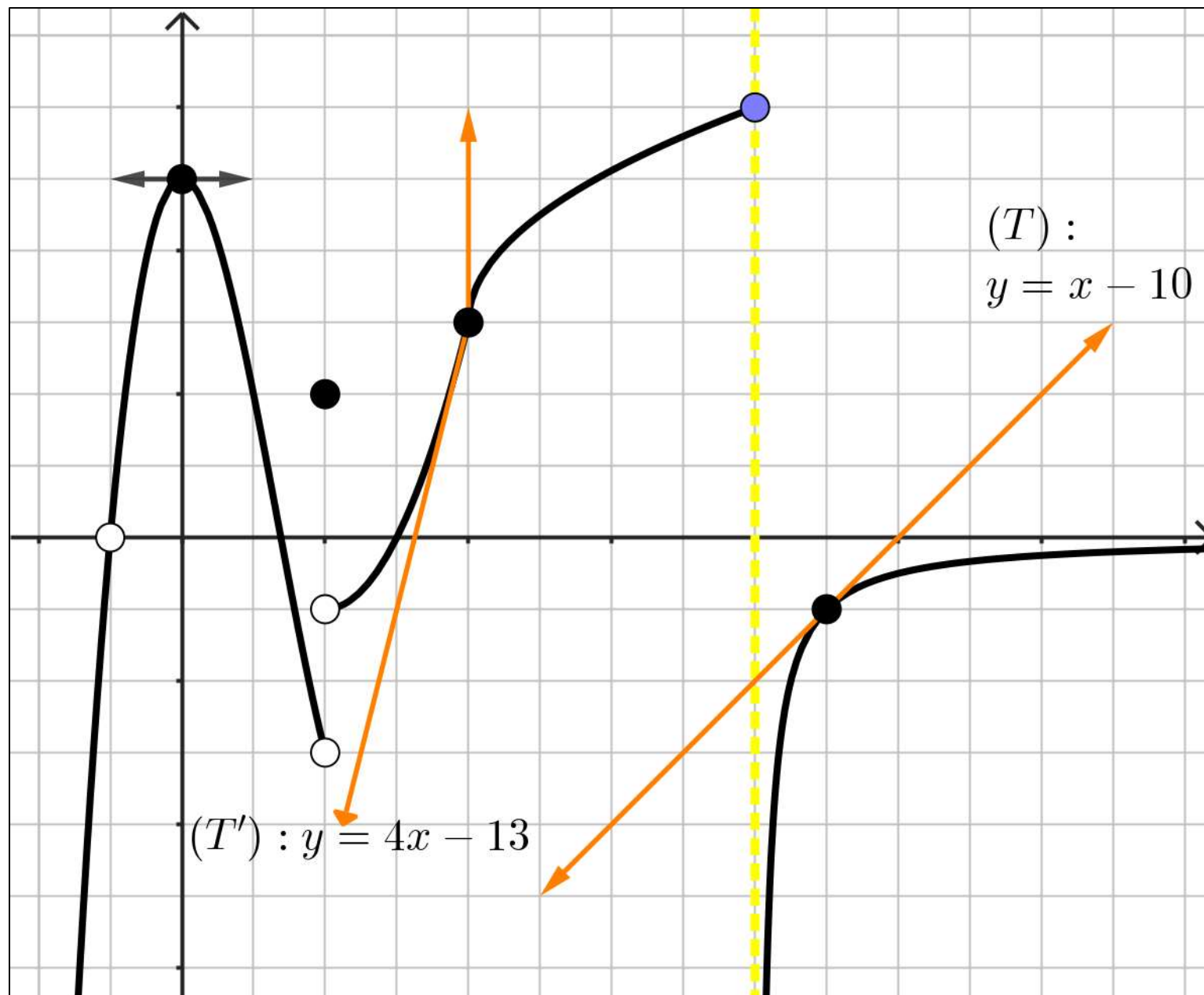
o)  $\lim_{x \rightarrow 4} \frac{f(x)-3}{x-4}$

Doesn't exist

Since

$$f'_-(4) = 4 \text{ and}$$

$$f'_+(4) = +\infty$$



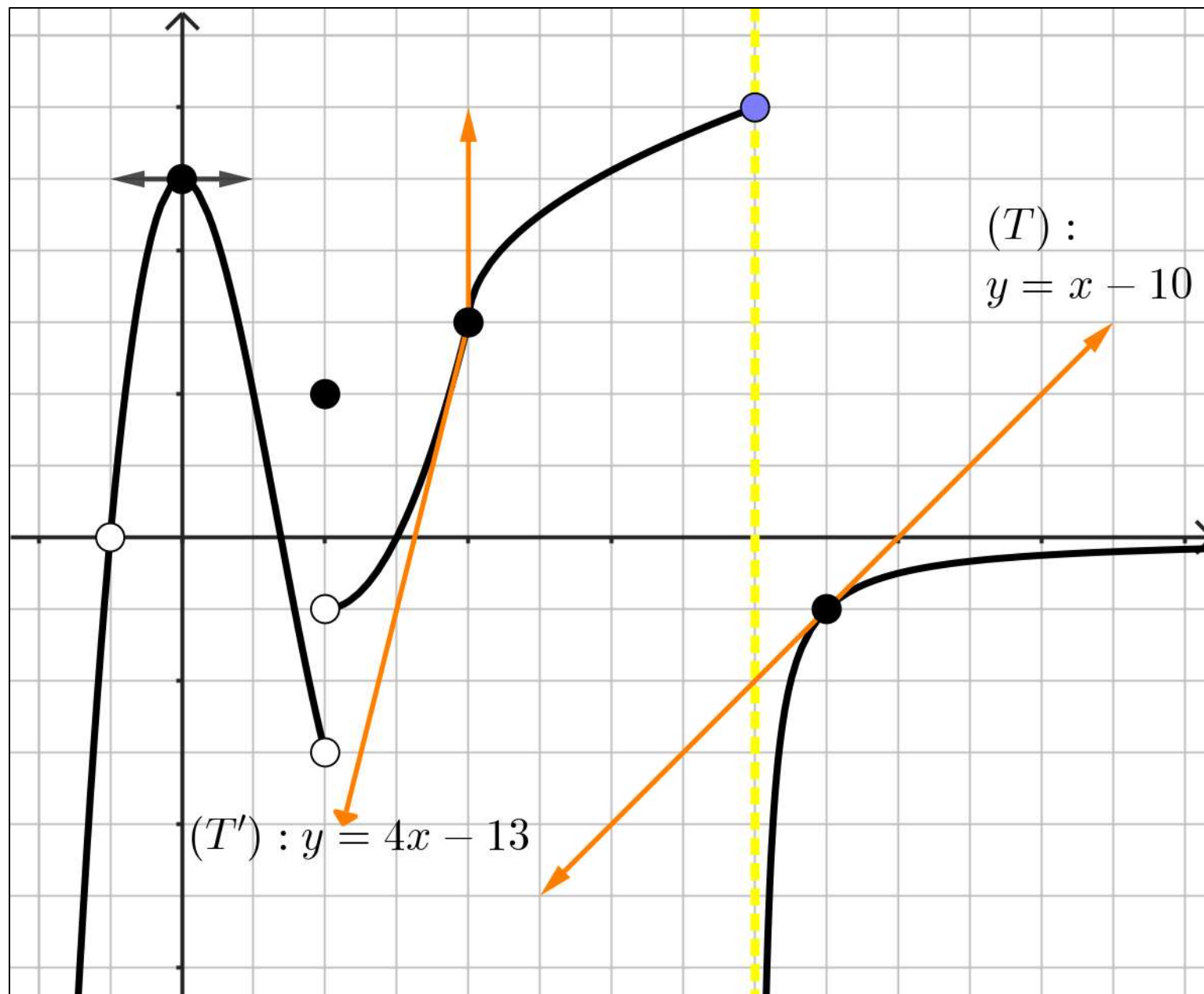
# Solved Exercise

$$p) \lim_{x \rightarrow +\infty} \frac{1}{f(x)}$$

$$\begin{aligned} \lim_{x \rightarrow +\infty} \frac{1}{f(x)} &= \frac{1}{\lim_{x \rightarrow +\infty} f(x)} \\ &= \frac{1}{0^-} \\ &= -\infty \end{aligned}$$

$$q) \lim_{x \rightarrow 4^+} \frac{4-x}{f(x)-3}$$

$$\begin{aligned} \lim_{x \rightarrow 4^+} \frac{4-x}{f(x)-f(4)} &= \frac{1}{f'_+(4)} = \frac{1}{+\infty} = 0 \end{aligned}$$



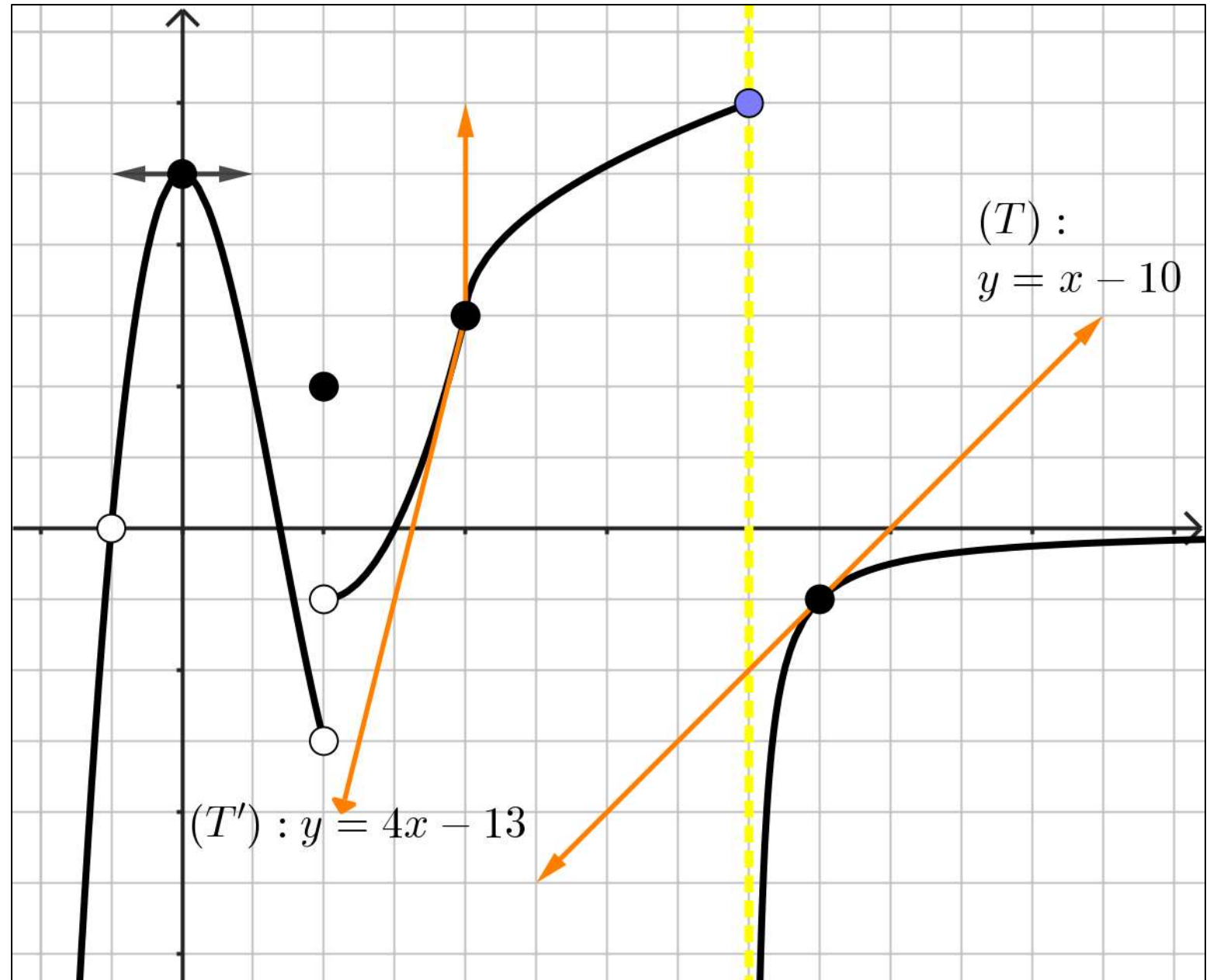
# Solved Exercise

r) Equation of vertical asymptote

$$x = 8$$

s) Equation of horizontal asymptote

$$y = 0$$



## Solved Exercise

t) The abscissa of a point where the function is continuous and not differentiable.

$$x = 4$$

u) The abscissa of a point where the limit exist but the function is not continuous.

$$x = -1$$

