Functions

Derivation (part 3)

Solved Exercise

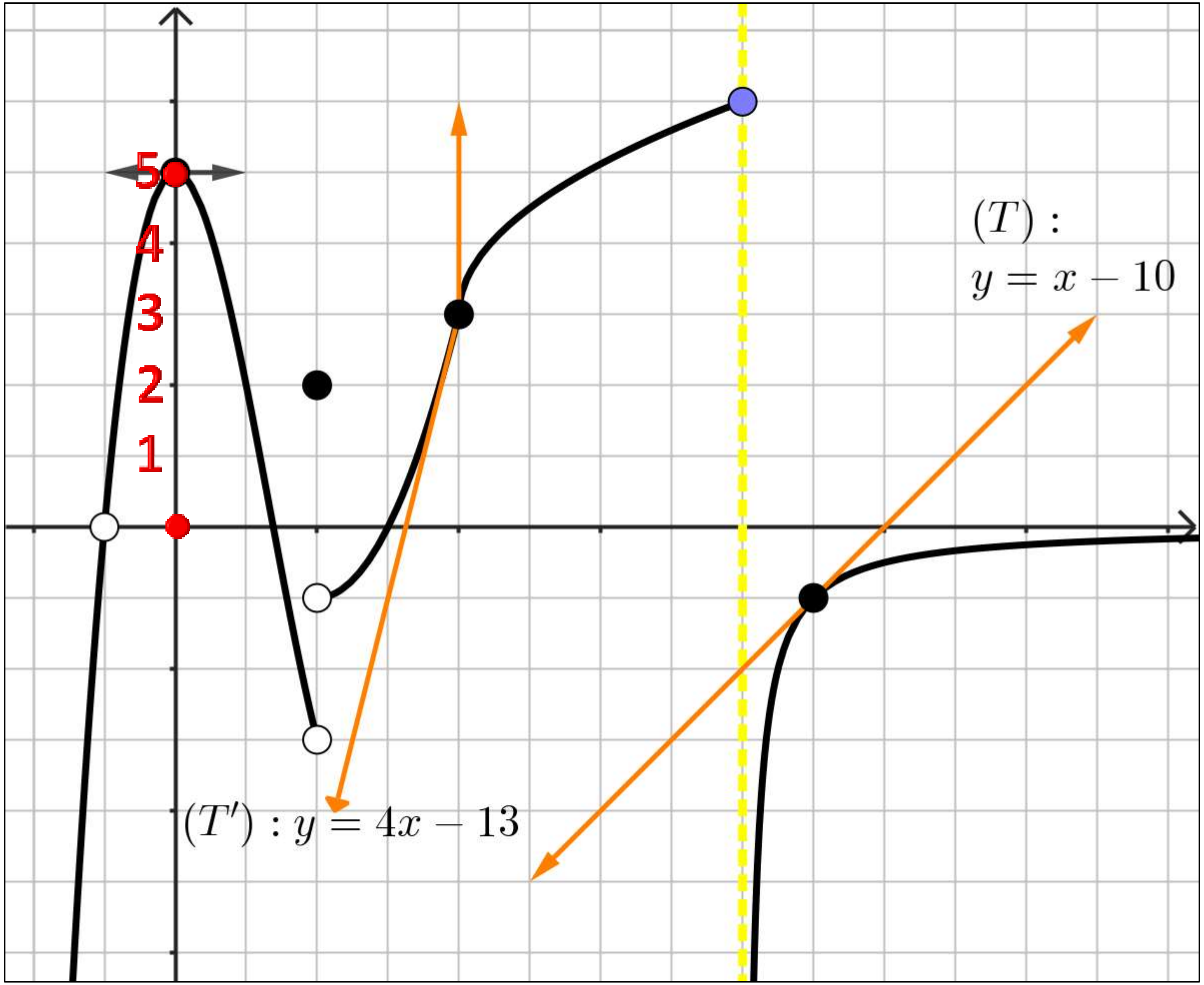
Consider the adjacent curve of a given function f.
Determine graphically:

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:

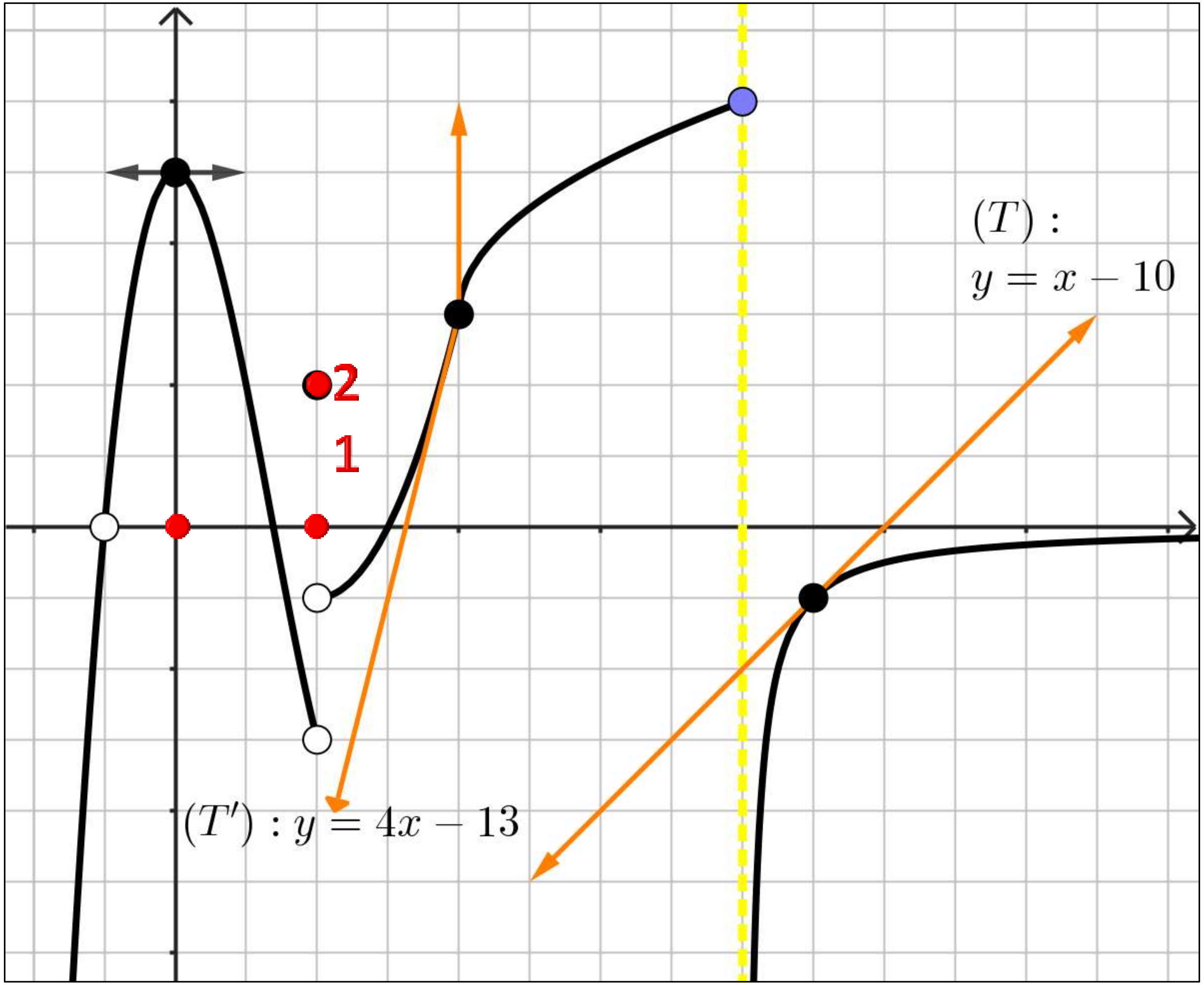
a) f(0)

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)

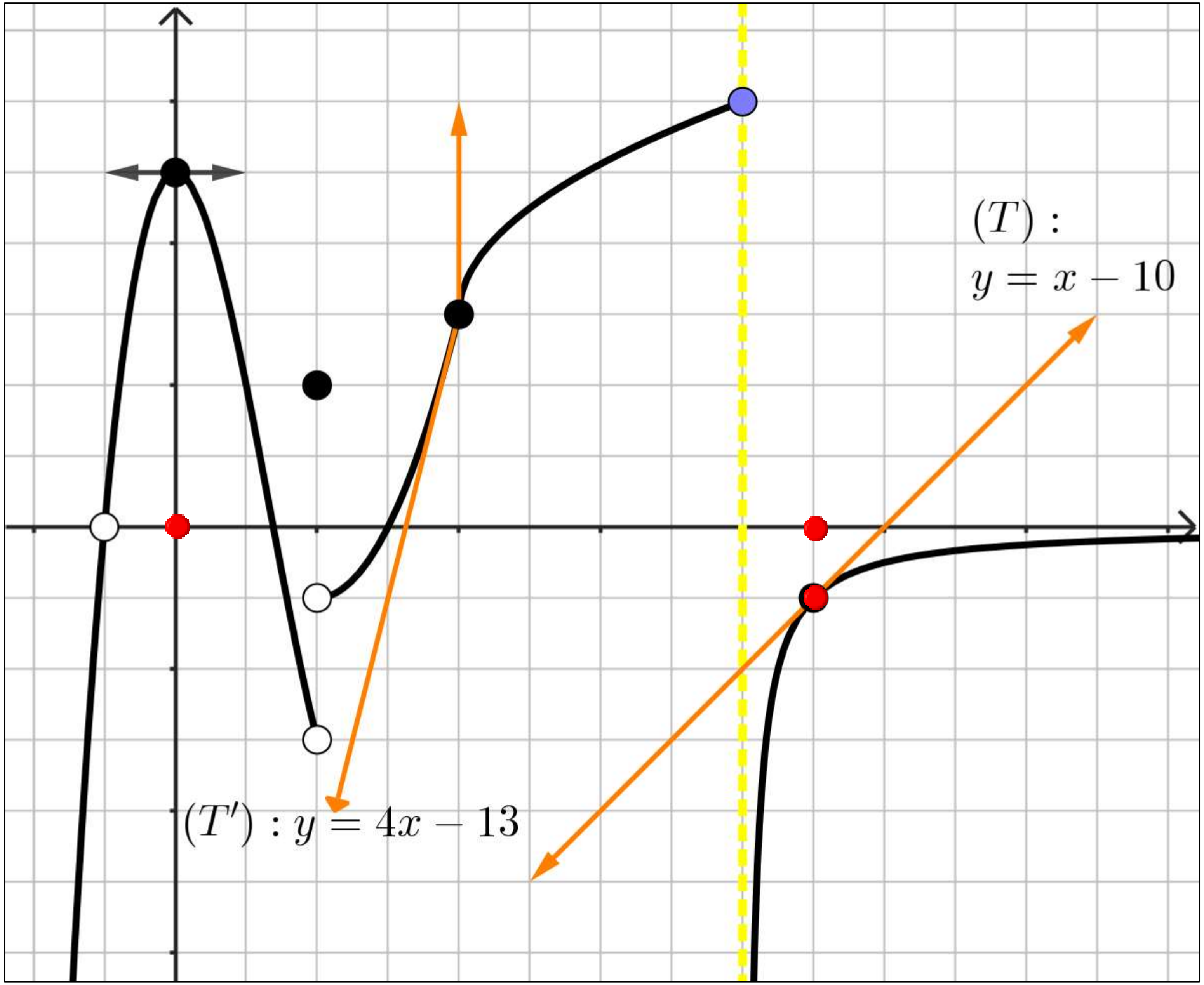
f(0)=5

b) f(2)

f(2)=2

c) f(9)

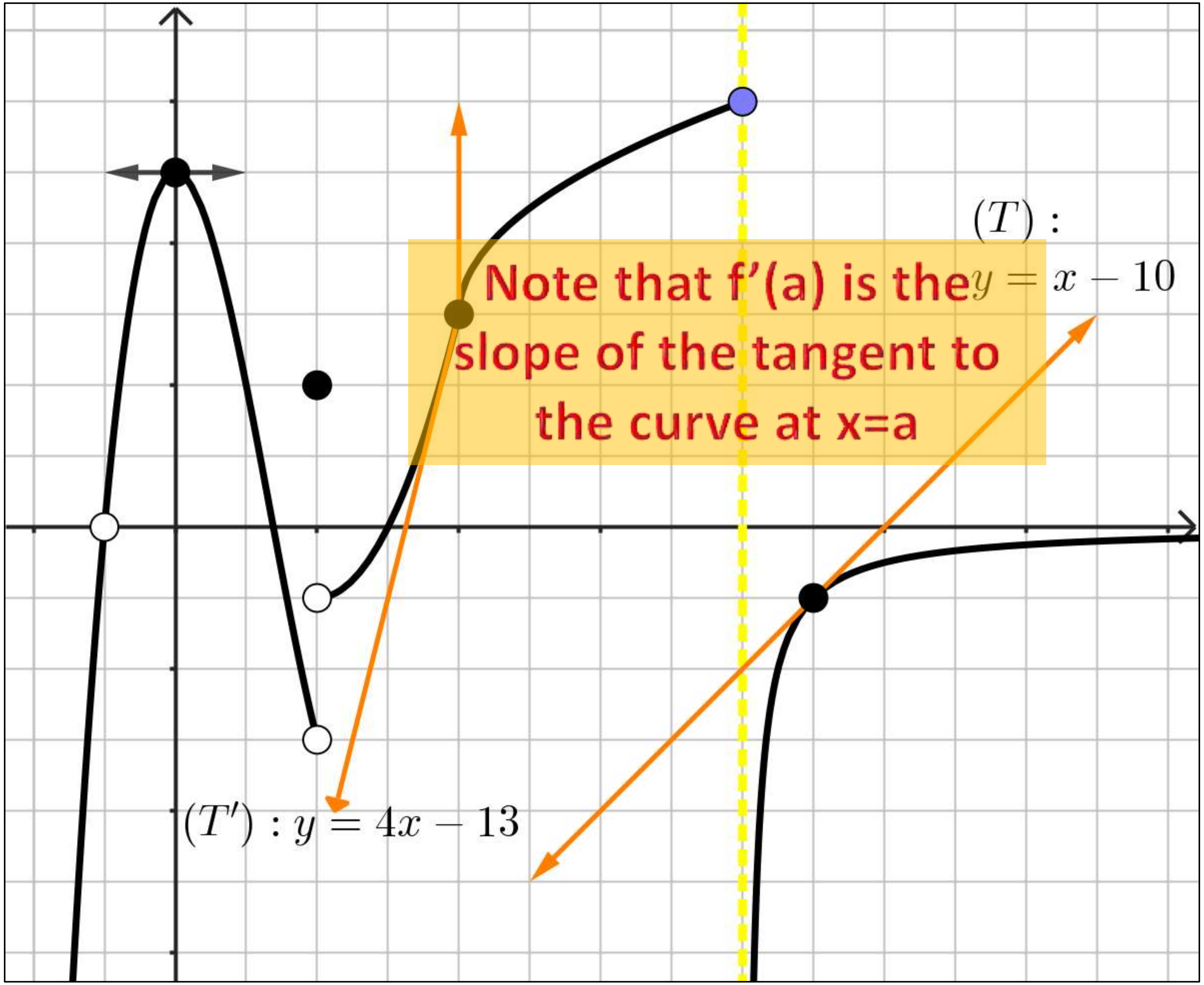
f(9)=-1



Solved Exercise

d) f ’(0)

e) f ’(4)



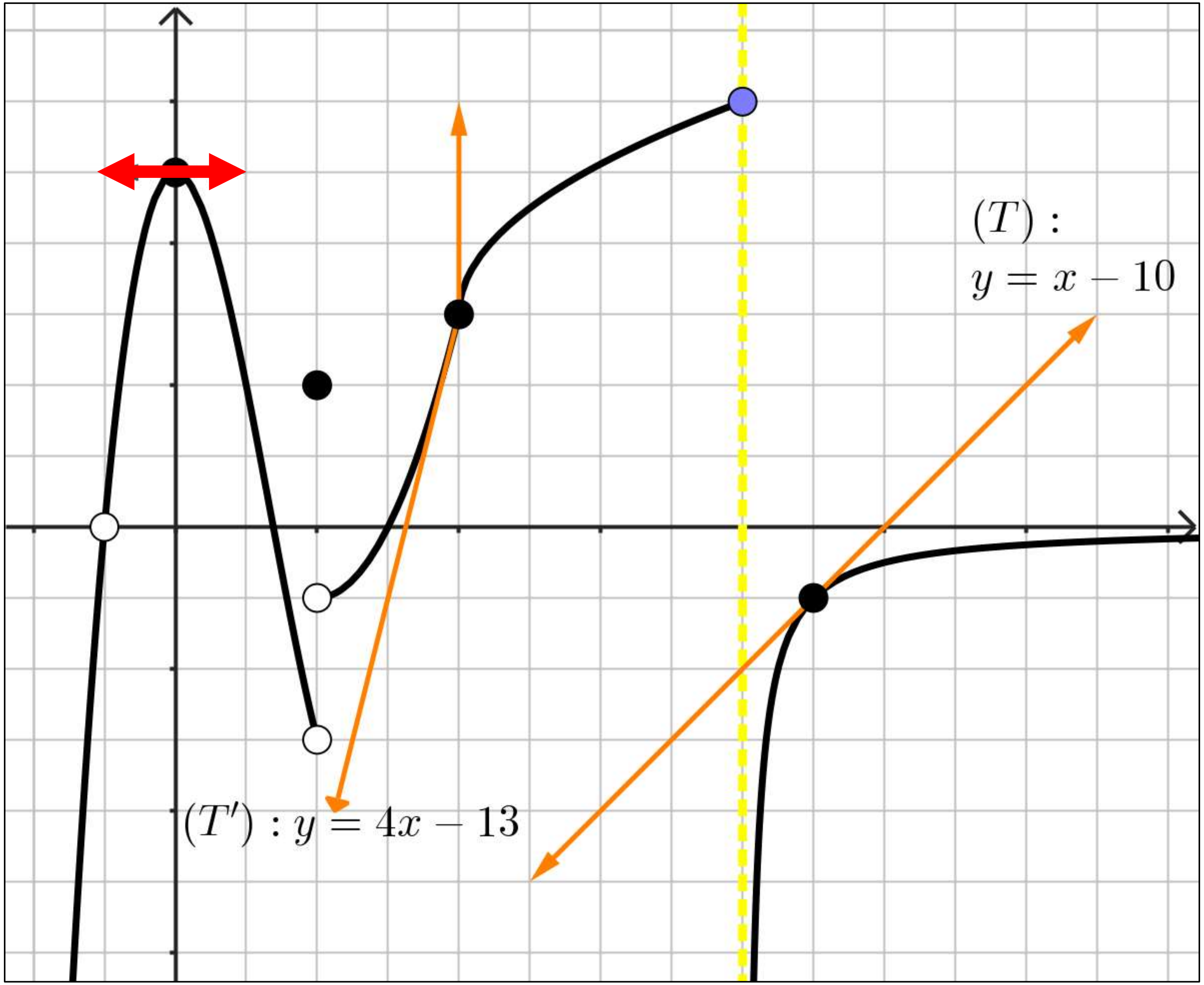
Solved Exercise

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

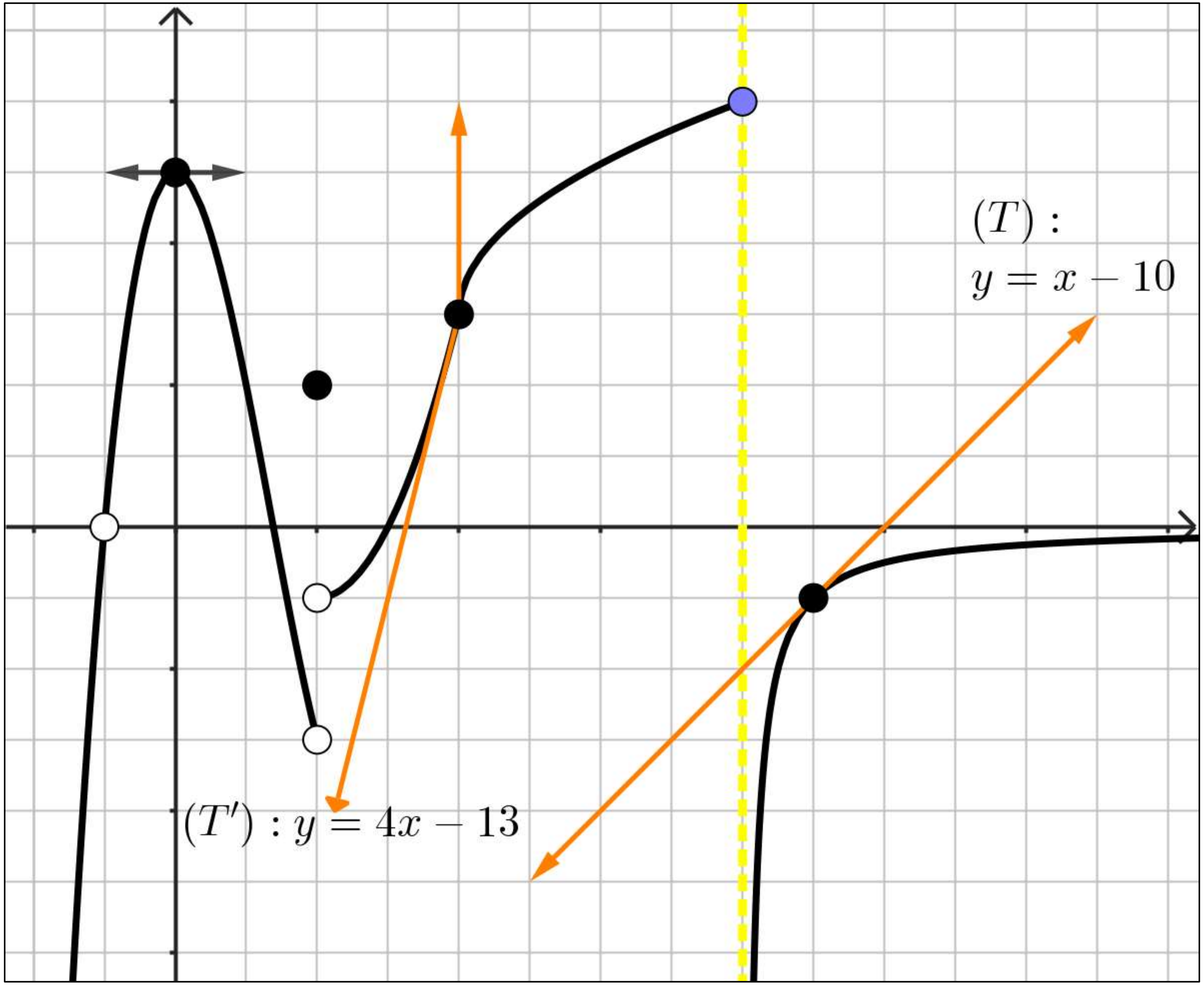
f) f'(9)

Tangent of slope 1

So f'(9)=1

g) f '(8)

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



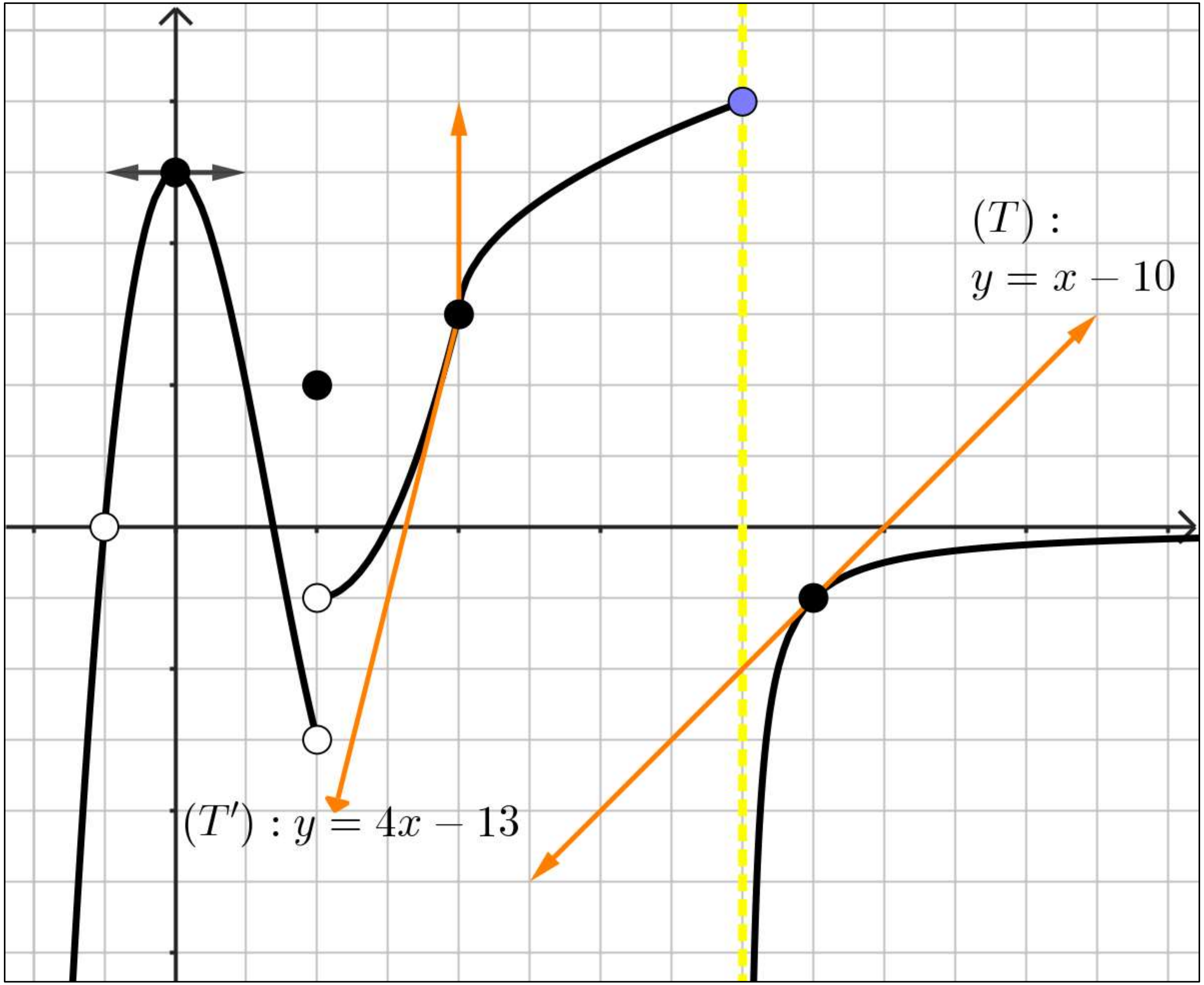
Solved Exercise

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

-∞

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

0



Solved Exercise

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

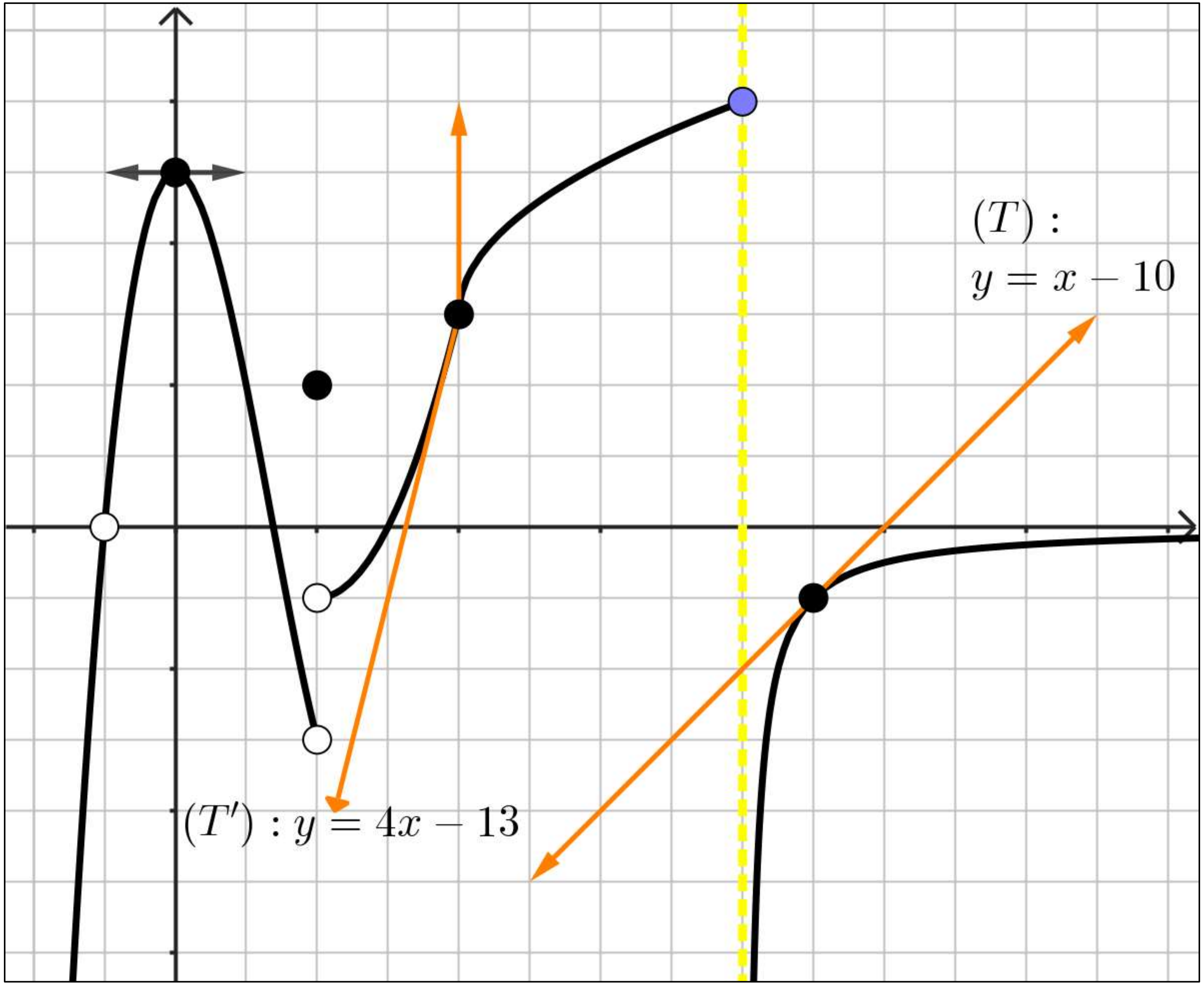
0

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

Doesn't exist since

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

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



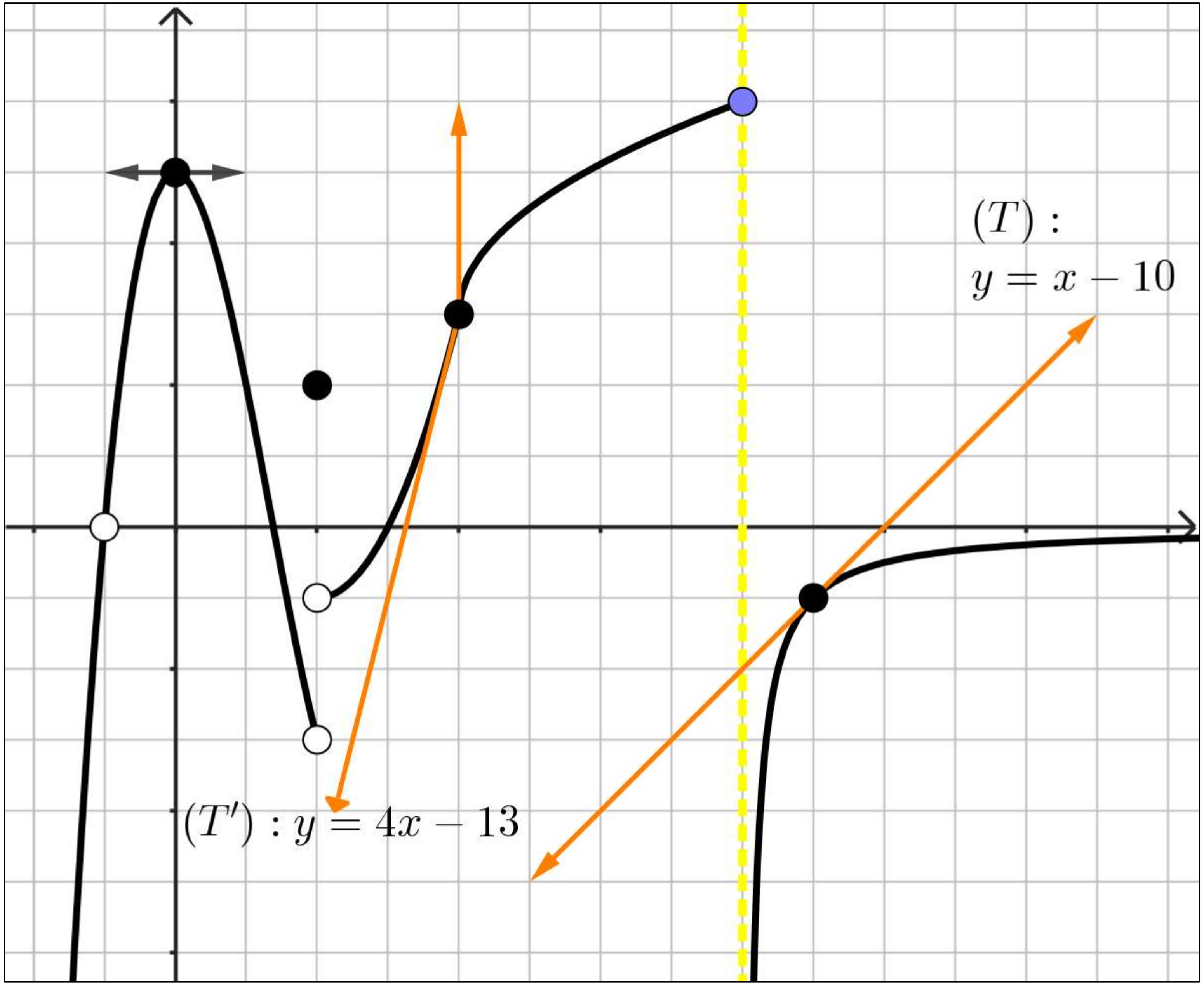
Solved Exercise

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

6

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

-∞



Solved Exercise

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

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

$=\lim_{x\to 9}\frac{f(x)-f(9)}{x-9}$

$=f'(9)=1$

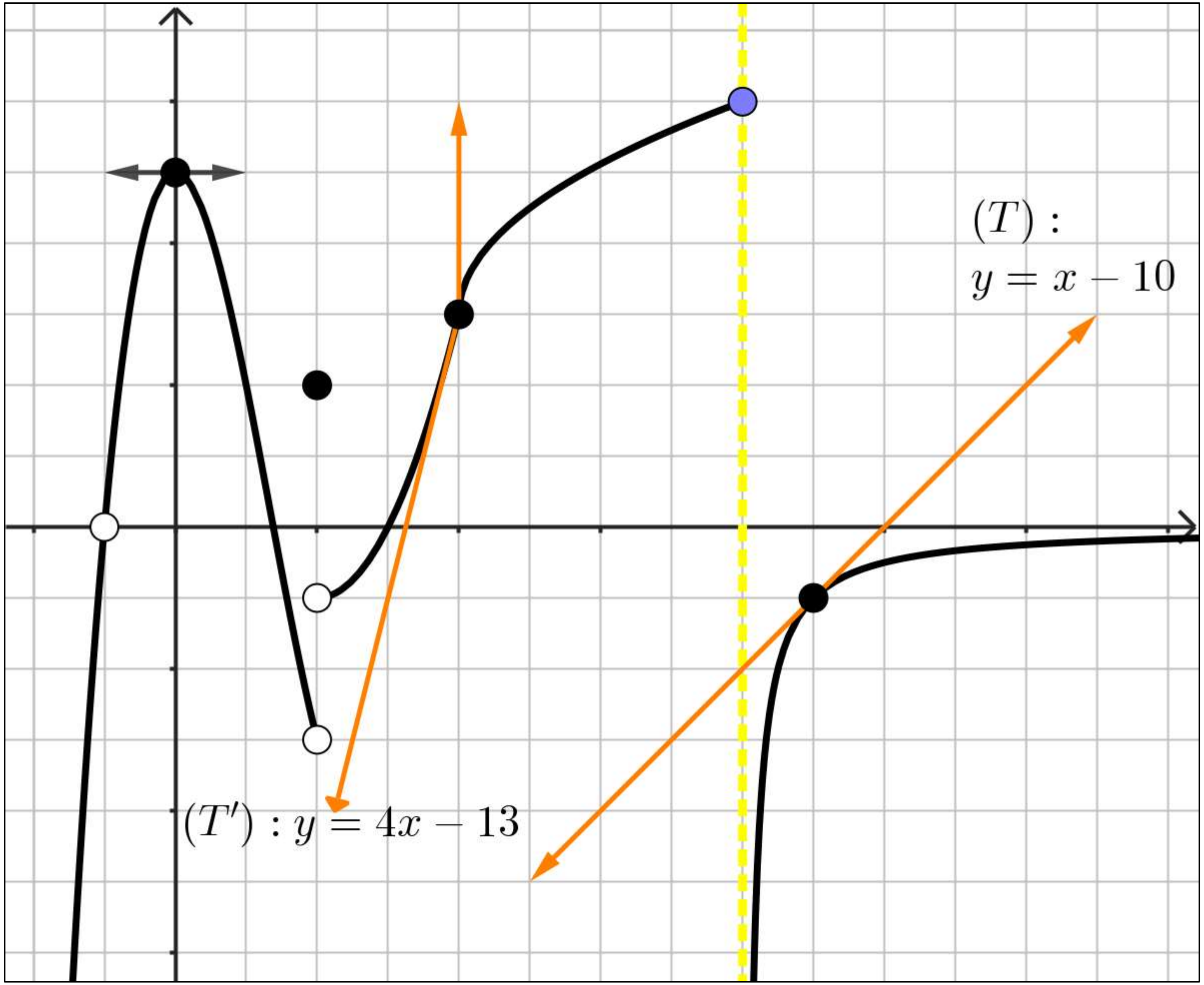
o) $\lim_{x\to 4}\frac{f(x)-3}{x-4}$

Doesn't exist

Since

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

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



Solved Exercise

p) $\lim\limits_{x\to+\infty} \dfrac{1}{f(x)}$

$$\lim_{x\to+\infty} \frac{1}{f(x)} = \frac{1}{\lim\limits_{x\to+\infty} f(x)}$$

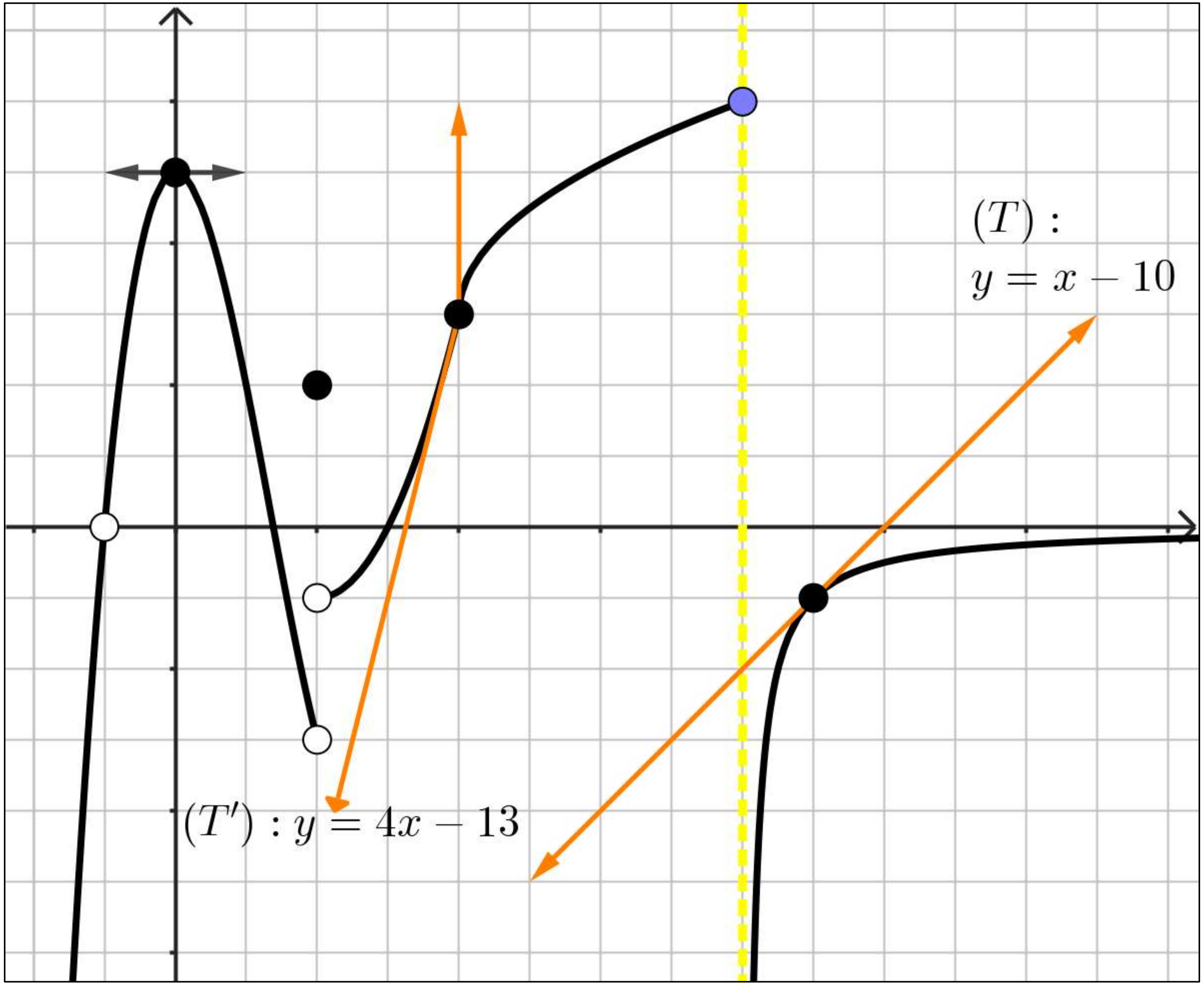
$$= \frac{1}{0^-}$$

$$= -\infty$$

q) $\lim\limits_{x\to4^+} \dfrac{4-x}{f(x)-3}$

$$\lim_{x\to4^+} \frac{4-x}{f(x)-f(4)}$$

$$= \frac{1}{f'_+(4)} = \frac{1}{+\infty} = 0$$



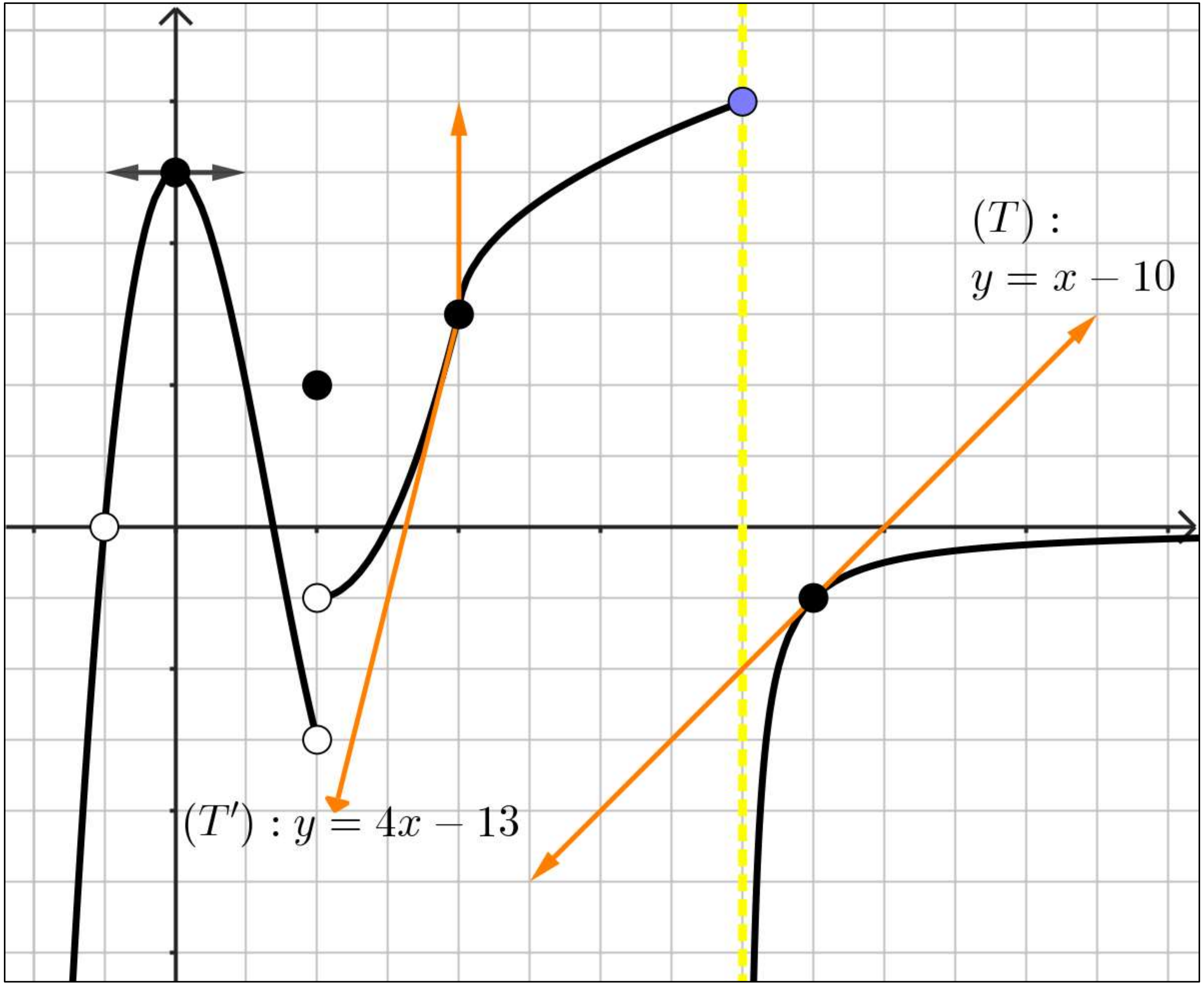
Solved Exercise

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.

$x = -1$