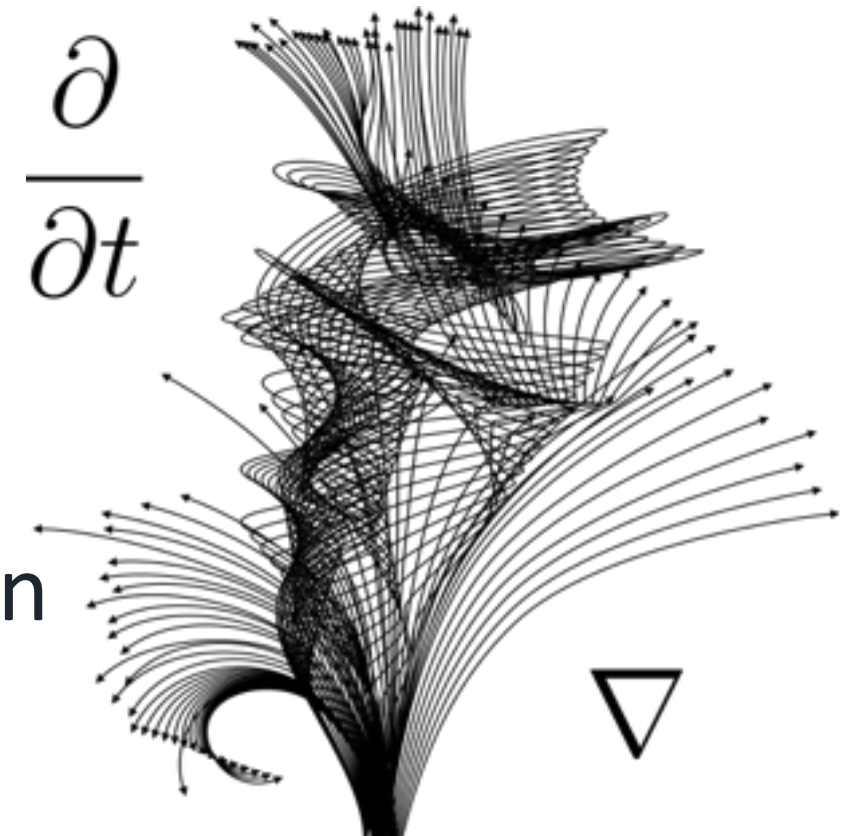
Differential Calculus with Applications to Life Sciences

Math 102:105

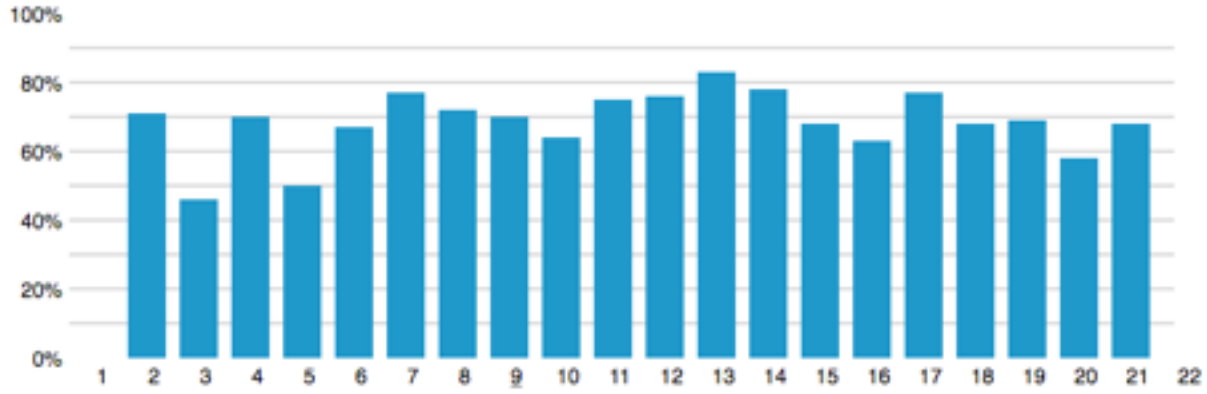
Pooya Ronagh

Agenda for today:

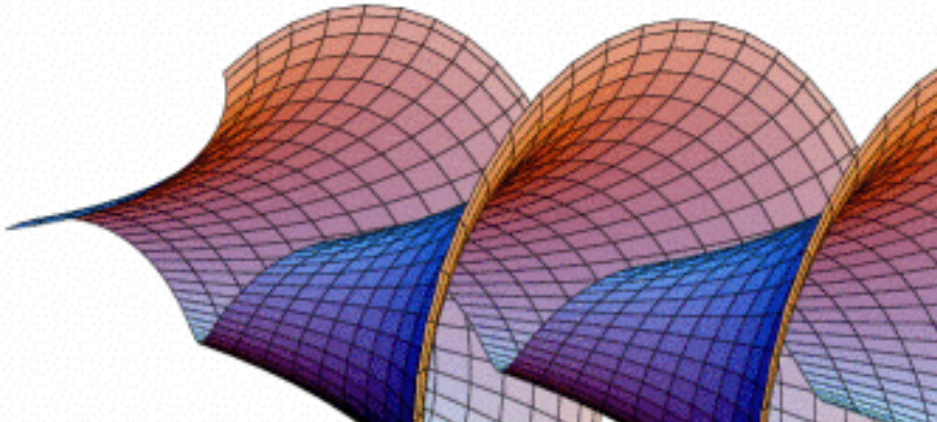
- What does your DT score mean?
- More limits and ensuring continuity
- Graphing the derivative as a function



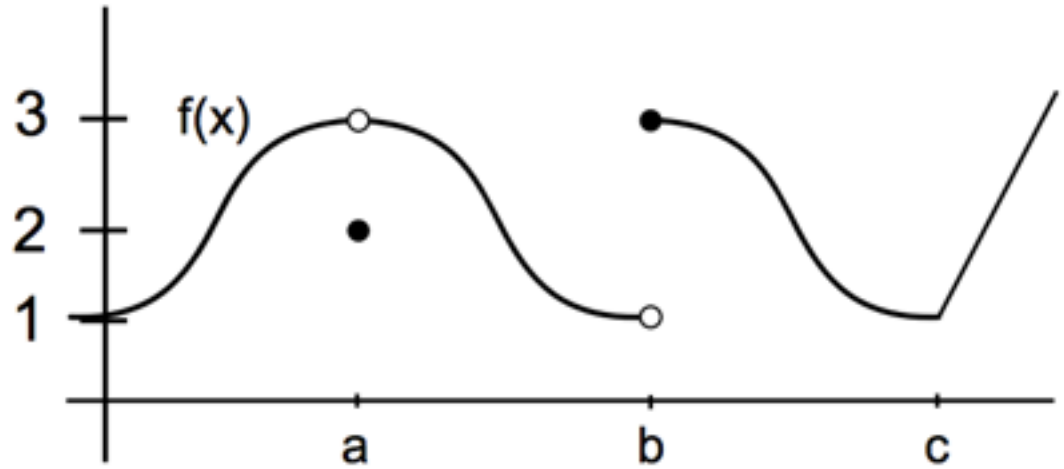
Diagnostic test



Average of all sections: 68%
Below 50%: about 25%
Above 82%: about 10%
From previous years: a bit lower than final mark of Math 102
If you didn't pass, come and talk to me/email me
Everyone else, fill in your gaps asap because you will fall into your pre-calc holes in this course!

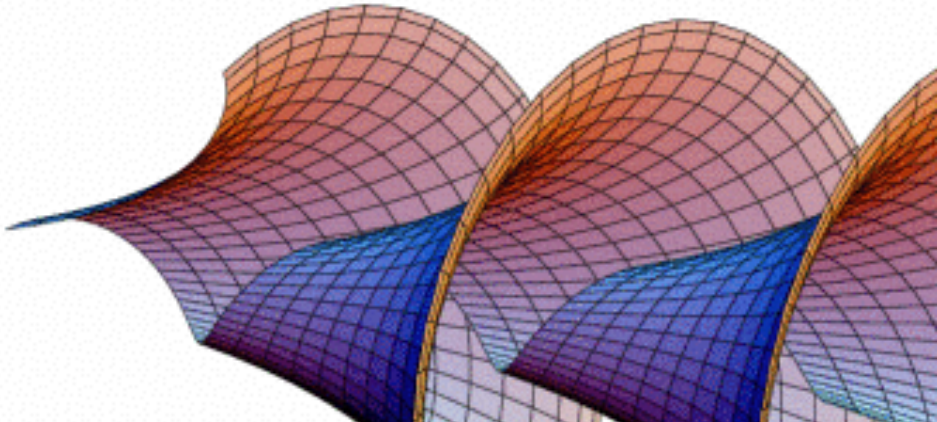


Last time: continuity



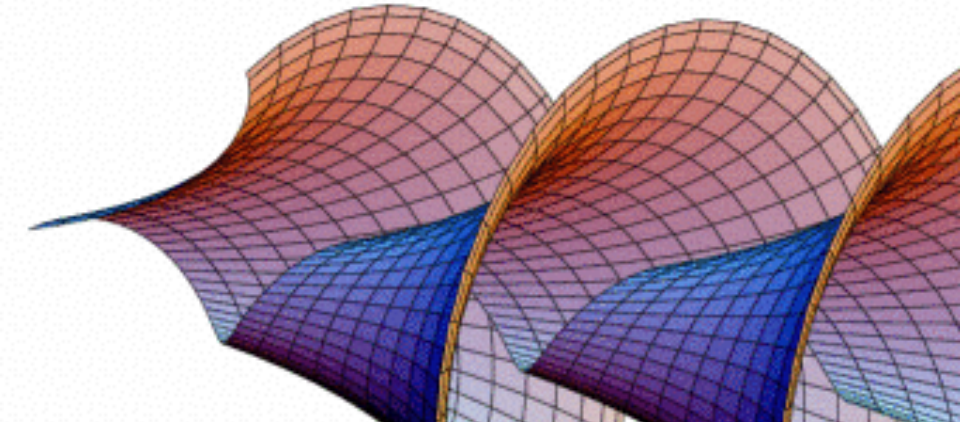
Continuity= Limit exists and is equal to the value of the function

Note: Function needs to be
continuous in order for it to be differentiable!
Is the inverse true?



Numerical calculation of derivative/limit

An example with a spreadsheet

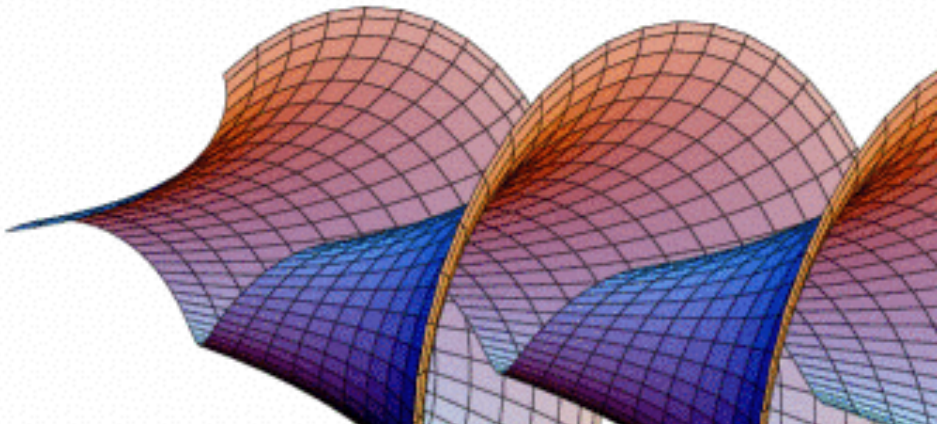


Ensuring continuity

For what value of a is the following function continuous?

$$f(x) = \begin{cases} 4 - a^2 + 3x & x < 1 \\ x^2 + ax & x \geq 1 \end{cases}$$

(A) a = 3
(B) a = -3
(C) a = 0
(D) a = 1
(E) Don’t know. Explain more please.

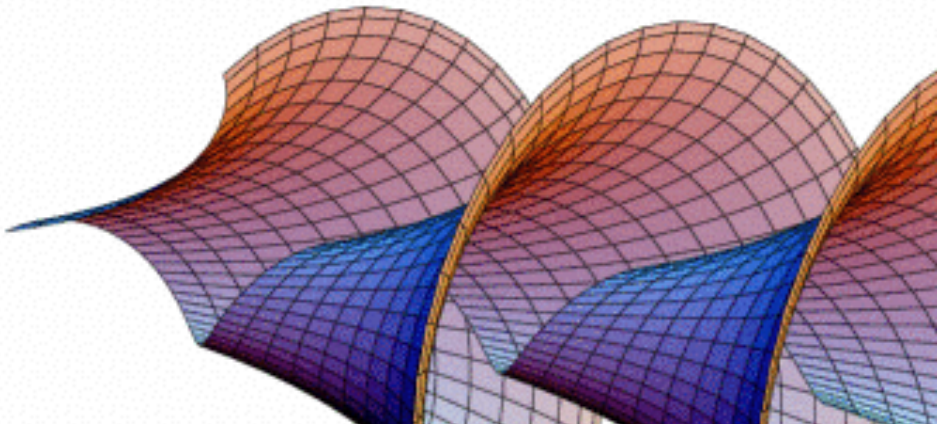


Limit at the point of continuity

Find

$$f(x) = \lim_{x \to 1} \frac{x^2 - 4}{x - 2}$$

(A) 3
(B) -3
(C) Undefined
(D) Infinity
(E) Don’t know

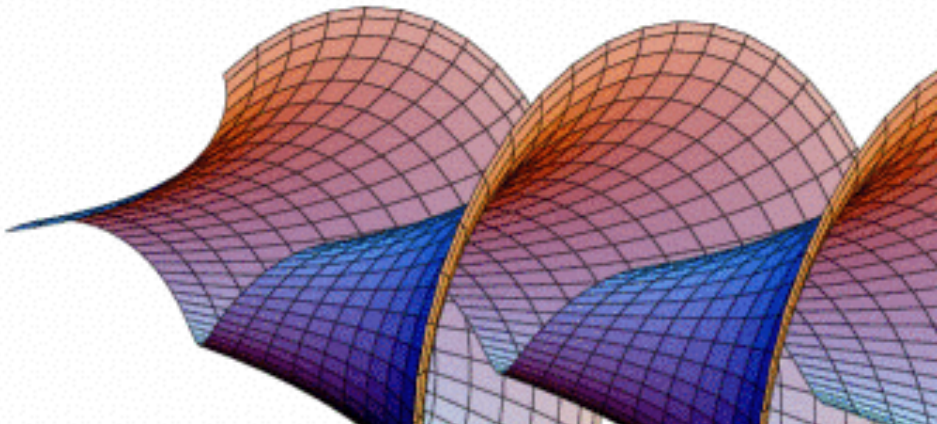


Limit for hole-in-the-graph

Find

$$f(x) = \lim_{x \to 2} \frac{x^2 - 4}{x - 2}$$

(A) Undefined
(B) 0
(C) 1
(D) 4
(E) Don't know

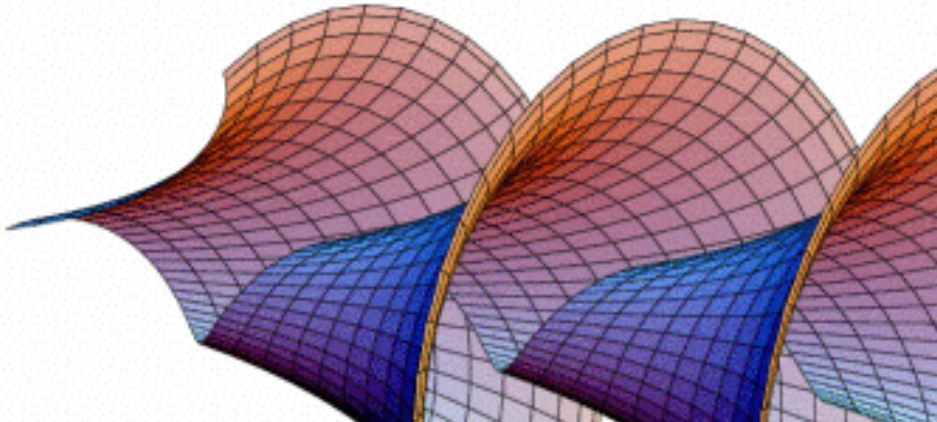


Limit for hole-in-the-graph

Interpret the limit

$$f(x) = \lim_{x \to 2} \frac{x^2 - 4}{x - 2}$$

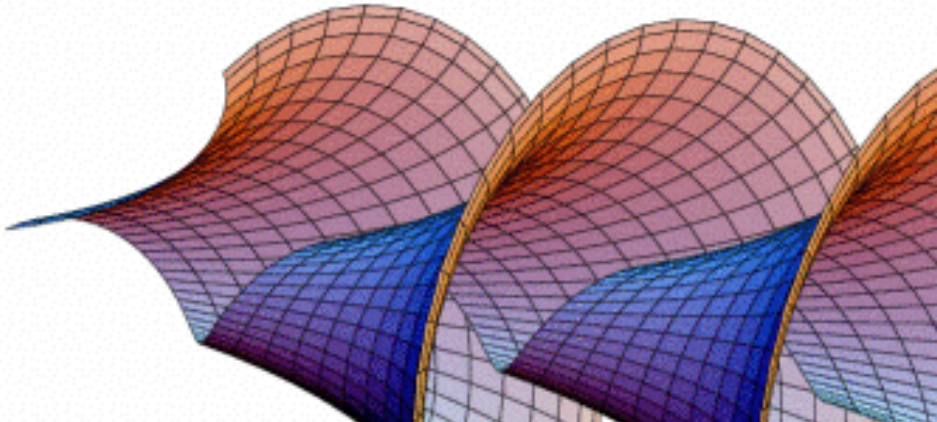
as a derivative!



Limits at infinity

Already talked about this: consider the terms with highest contribution

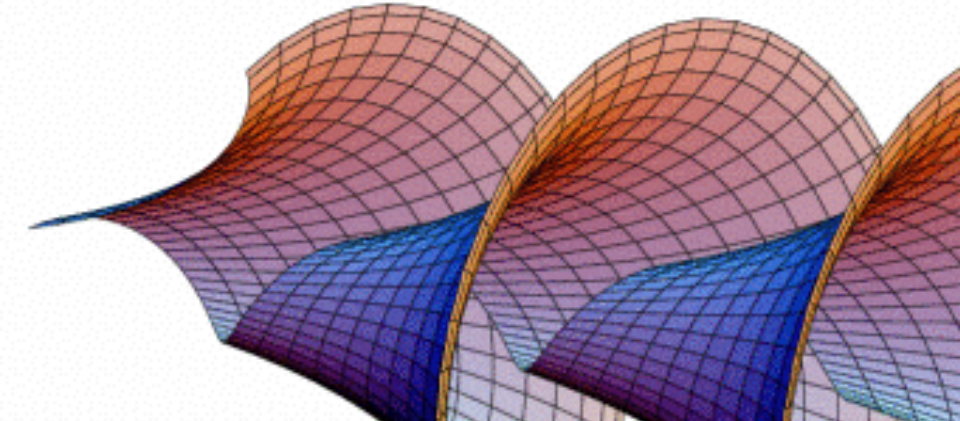
$$\lim_{x \to \infty} \frac{2x^5 - 4x^3}{5x^4 + 4x + 10}$$



Graph of the function and the derivative

Derivative = slope of the tangent line, therefore:

Derivative encodes the local behaviour of the function.

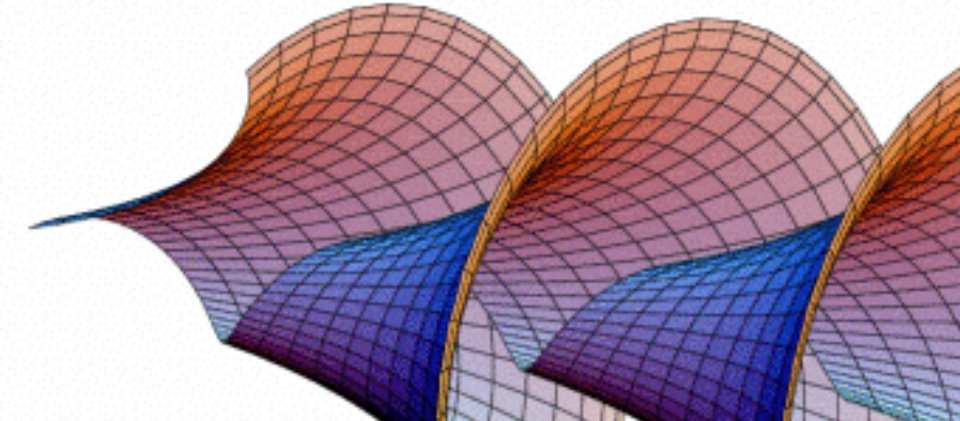


Graph of the function and the derivative

Derivative = slope of the tangent line, therefore:

Derivative encodes the local behaviour of the function.

Tangent line is the the **unique** line that looks like the function when you zoom in!

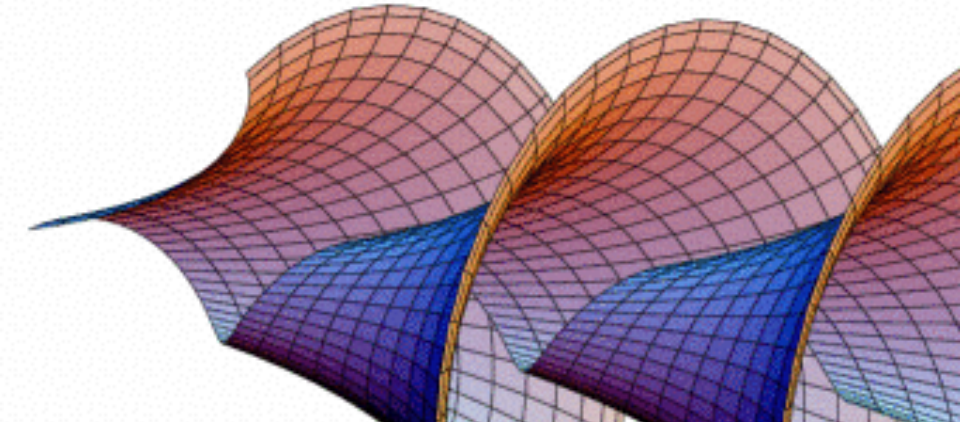


Graph of the derivative

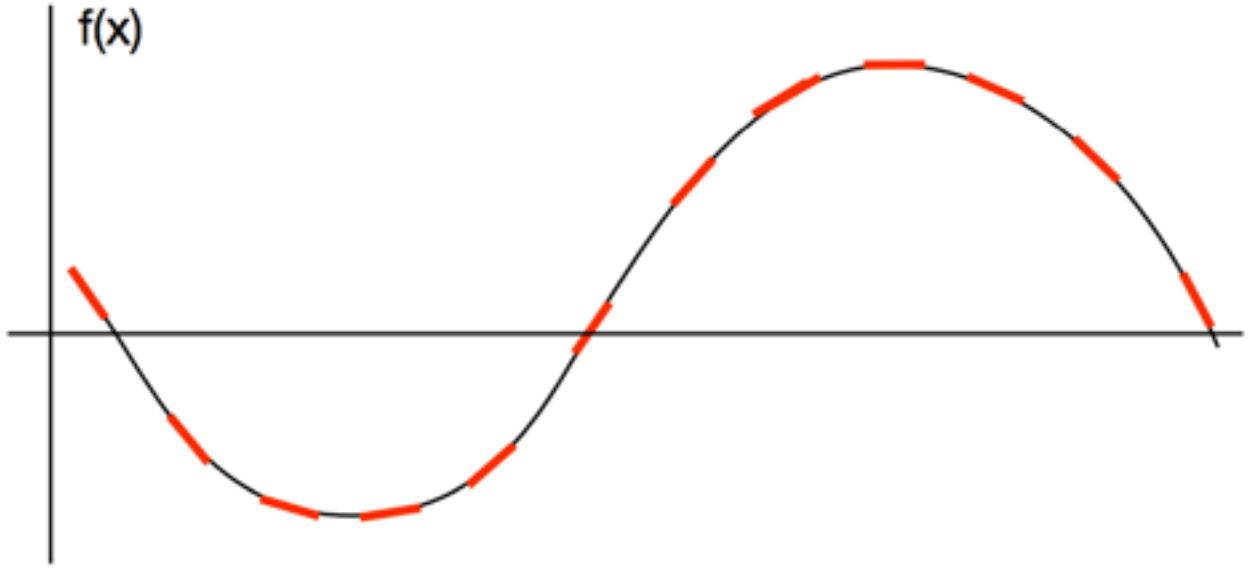
The function that associates to every point x = a the derivative of y= f(x) at the point

$$a \mapsto f'(a)$$

is **itself a function**.



Graph of the derivative



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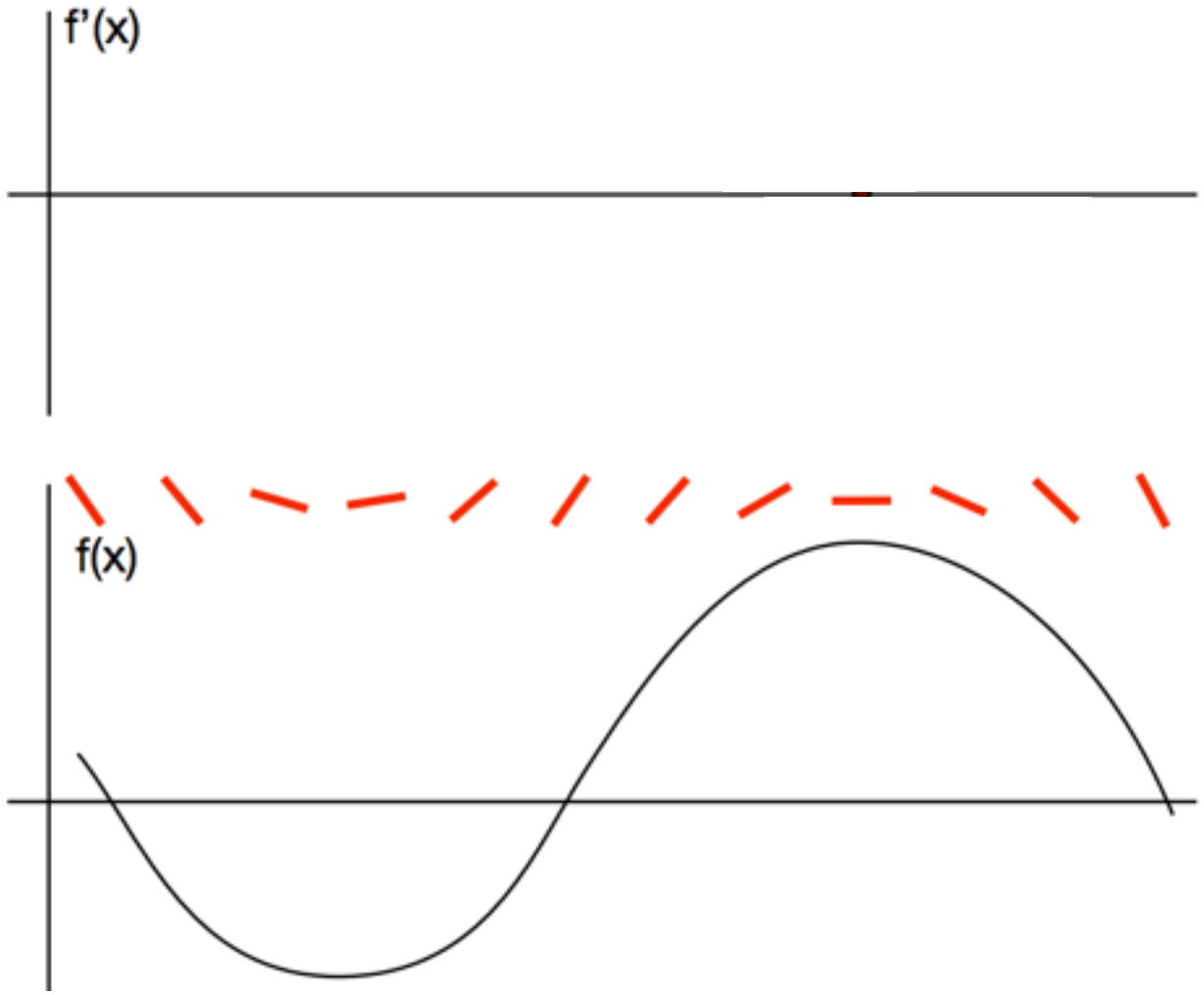

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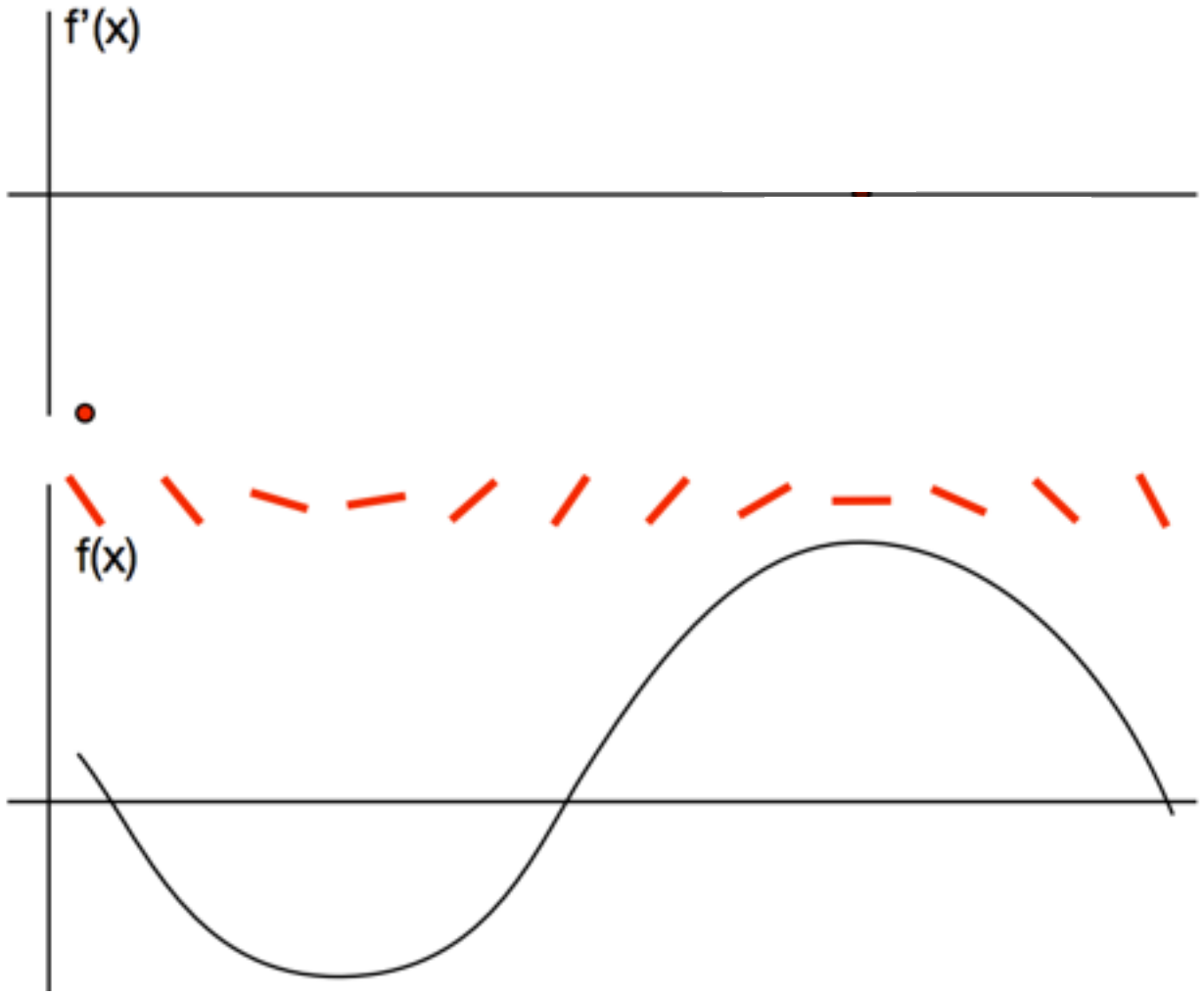

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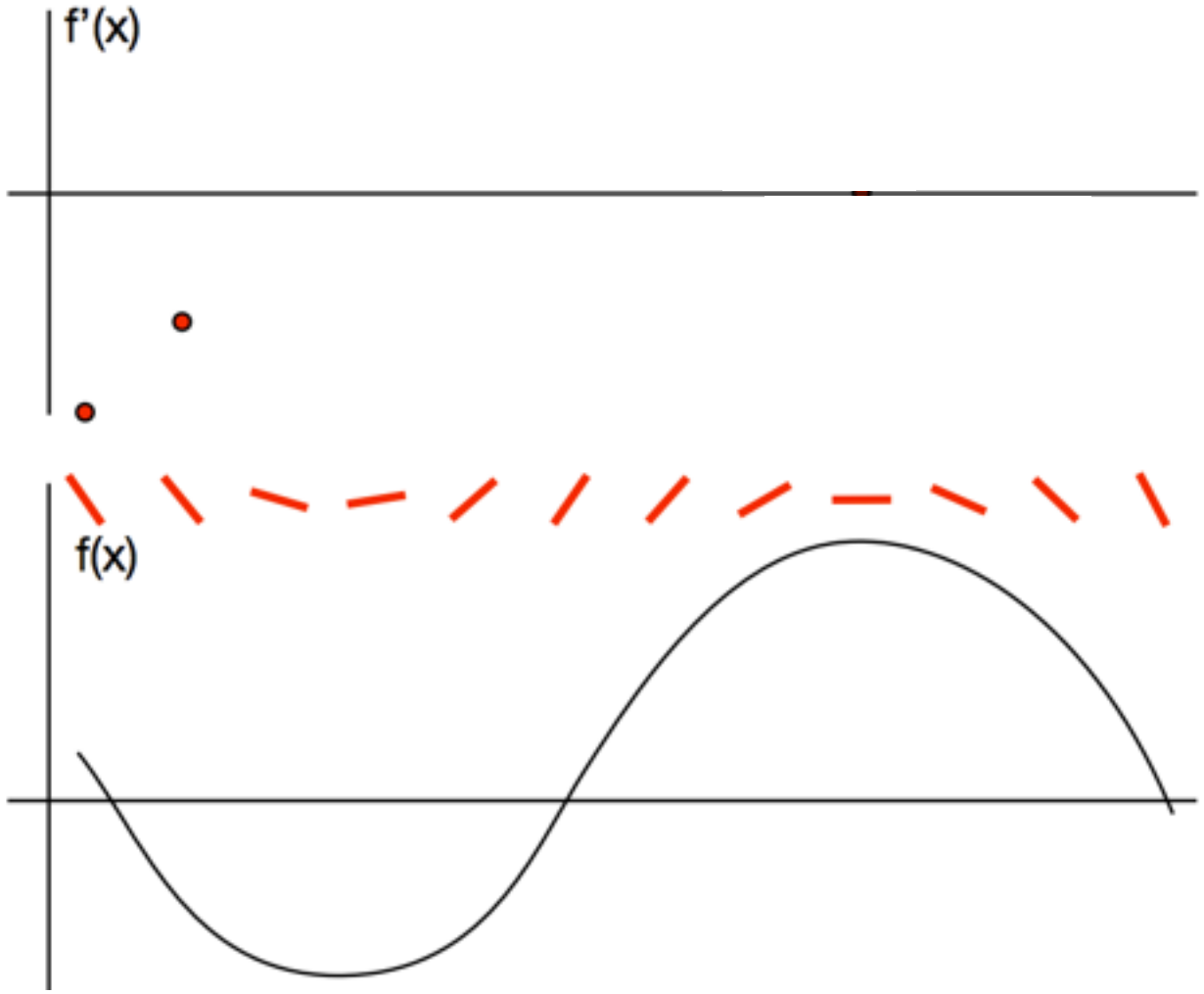

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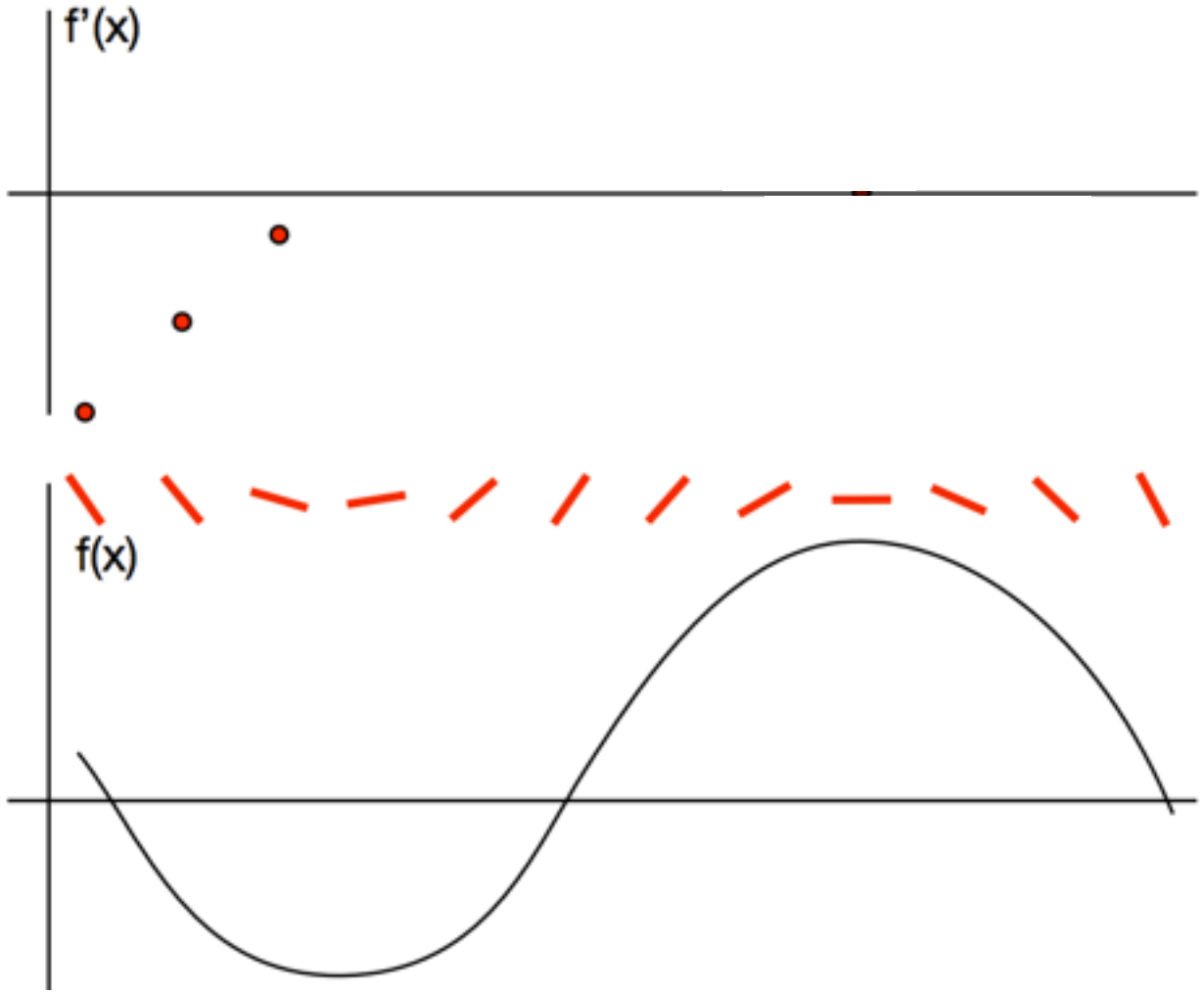

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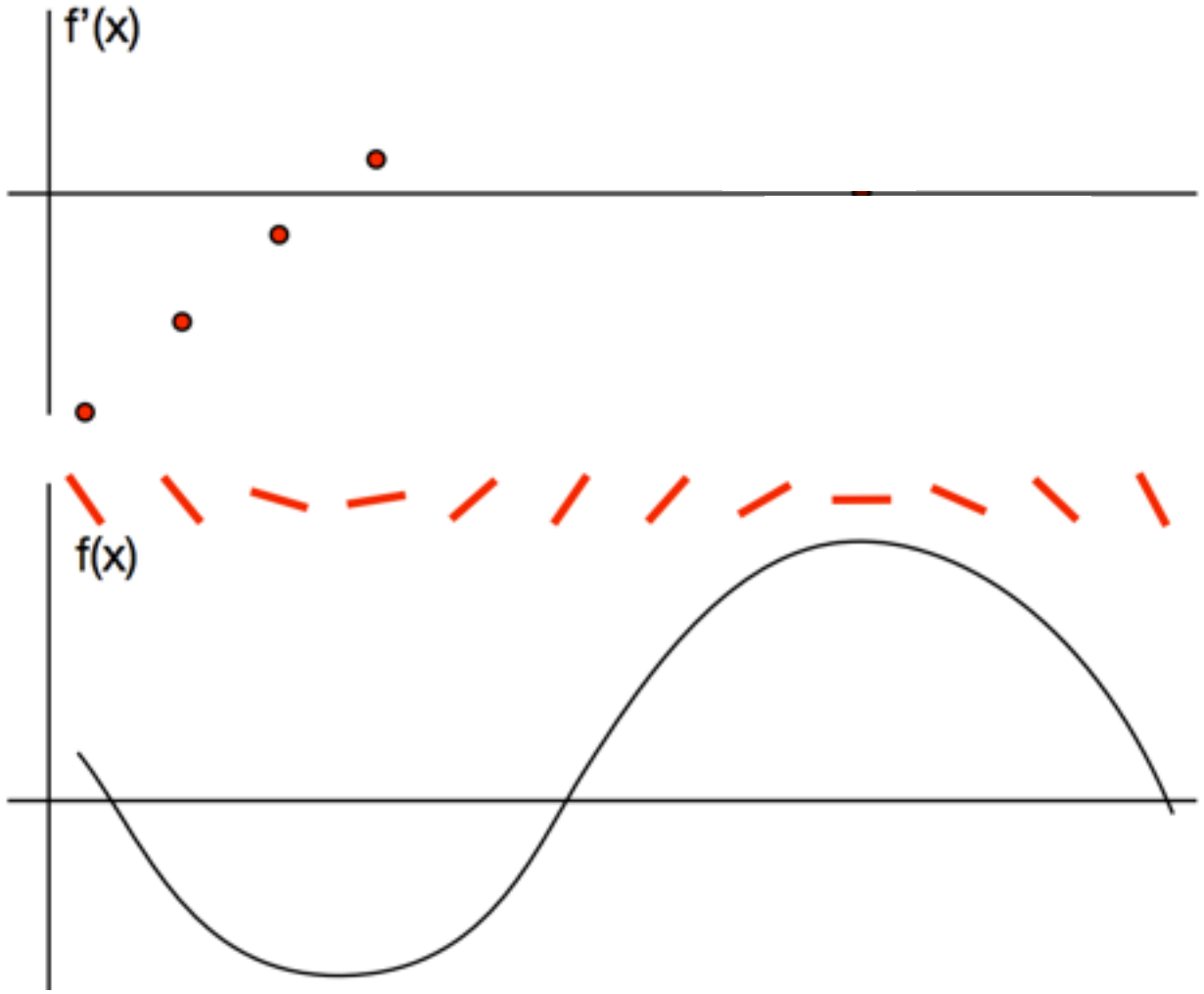

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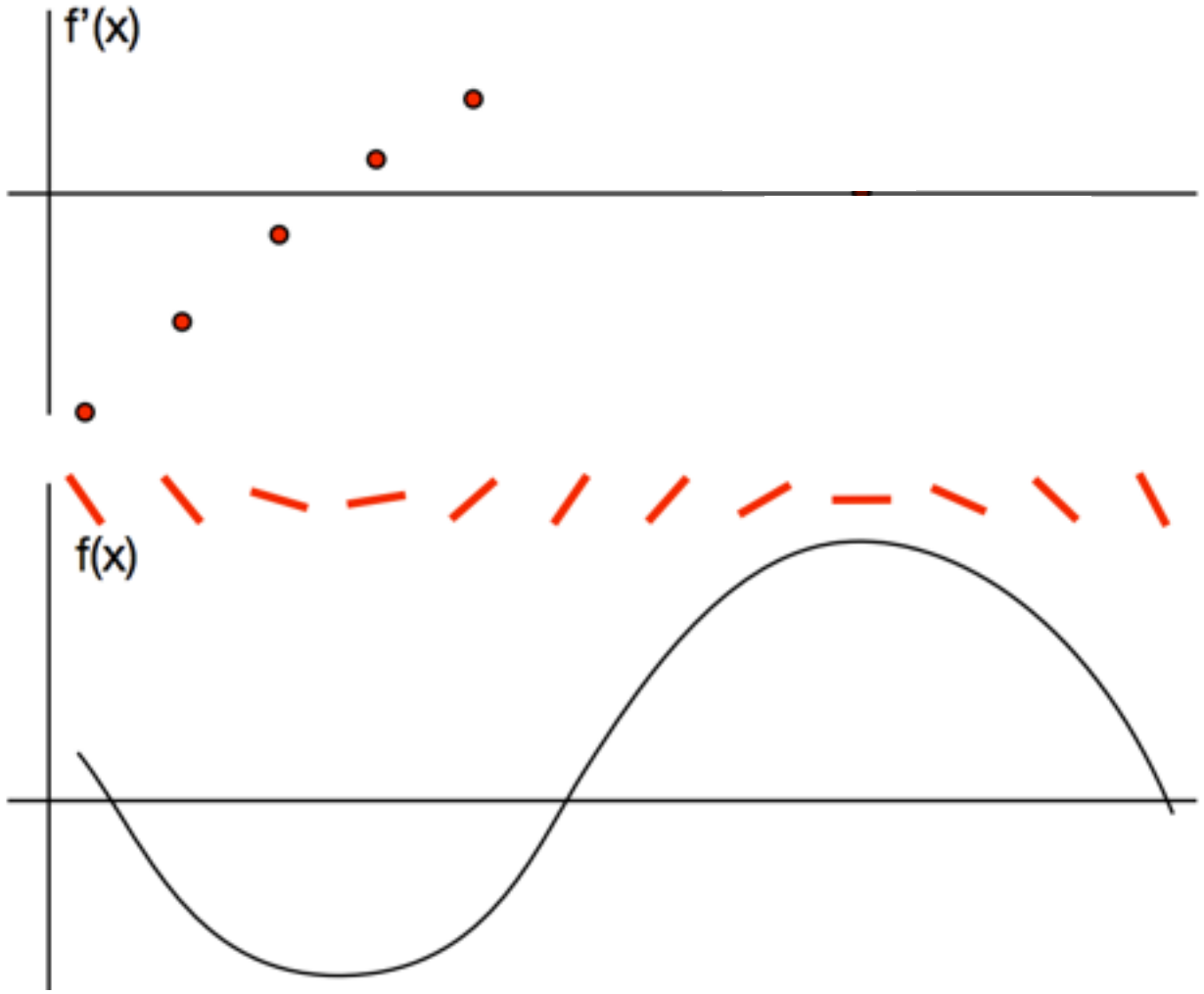
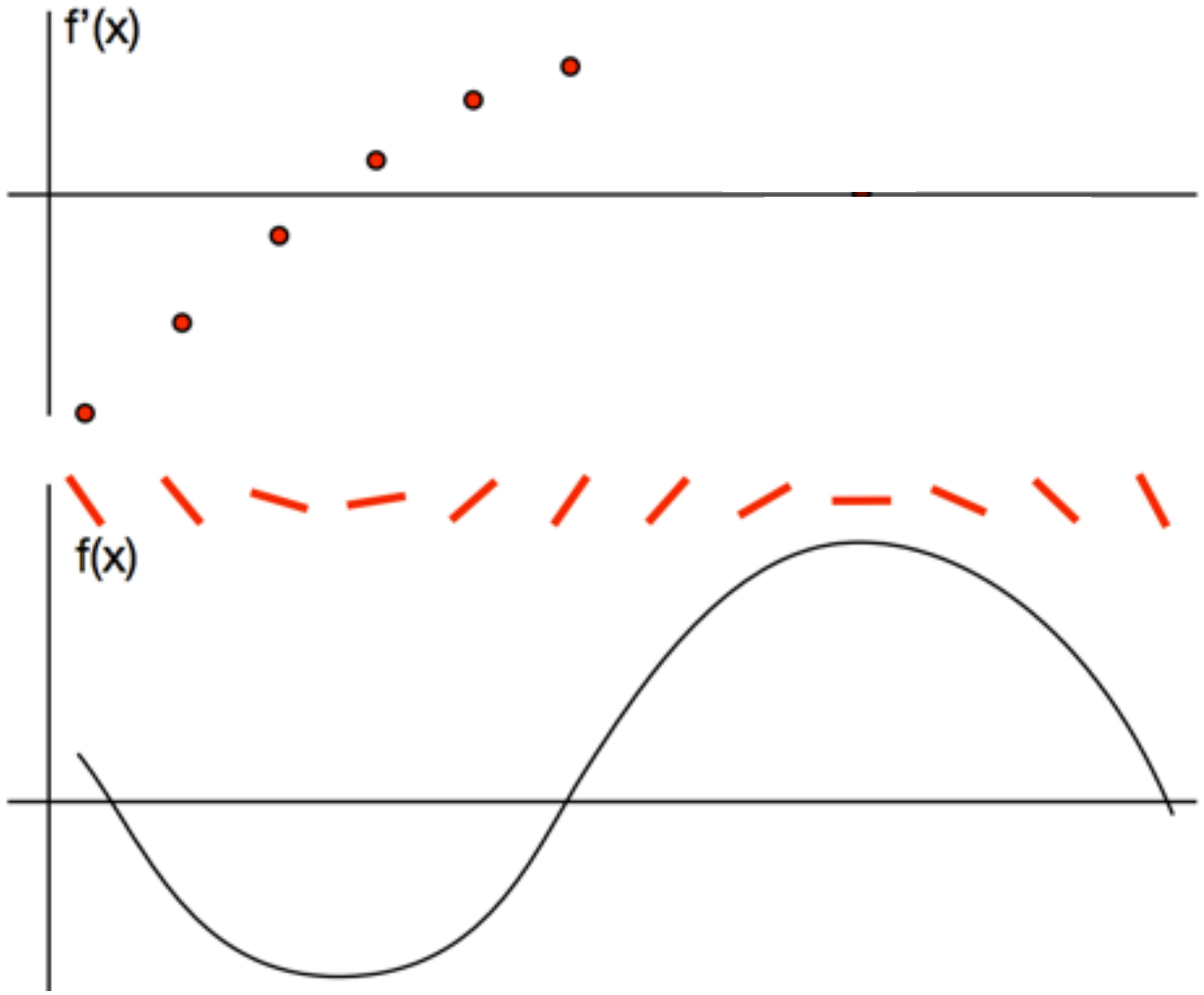


Graph of the derivative



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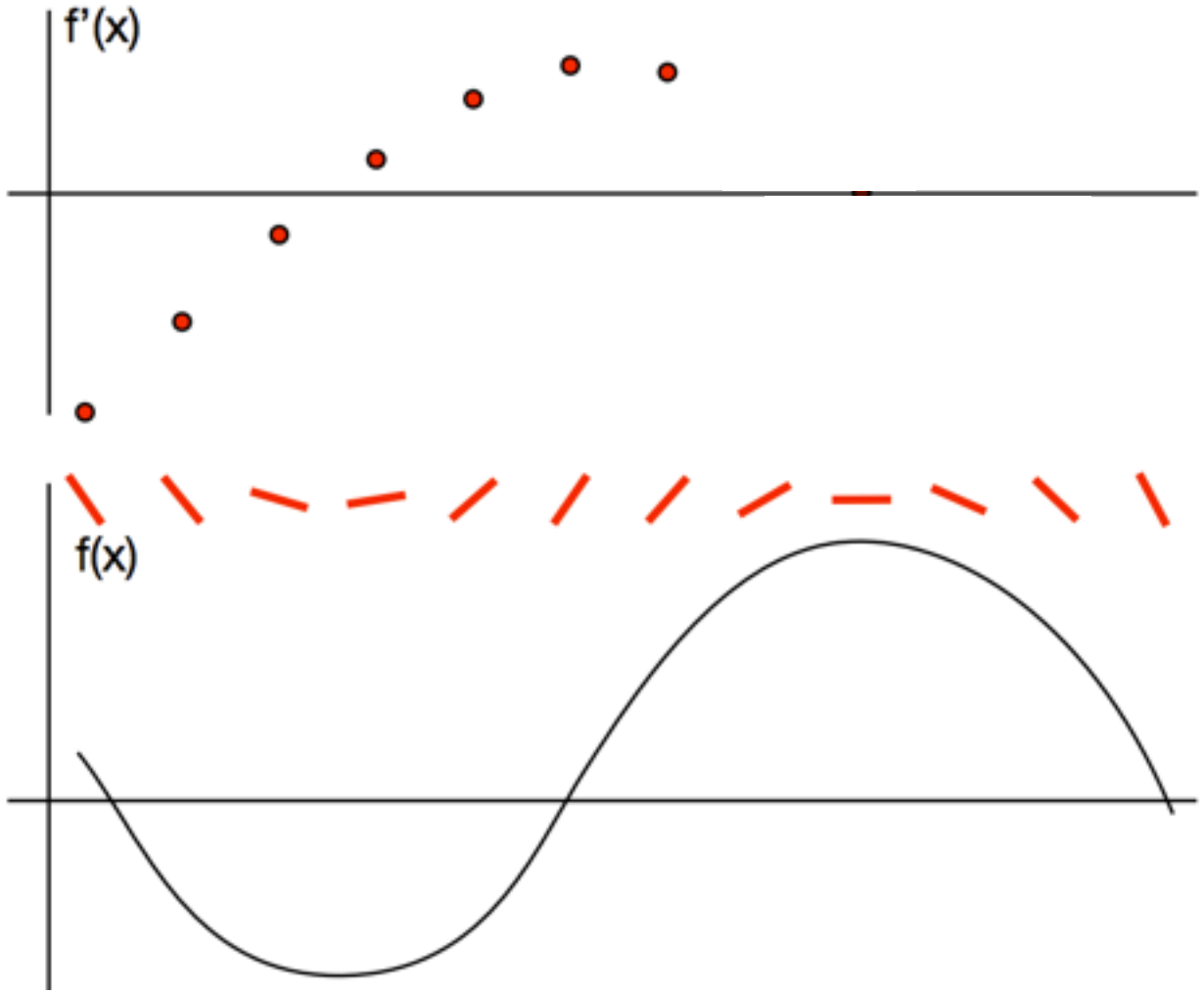

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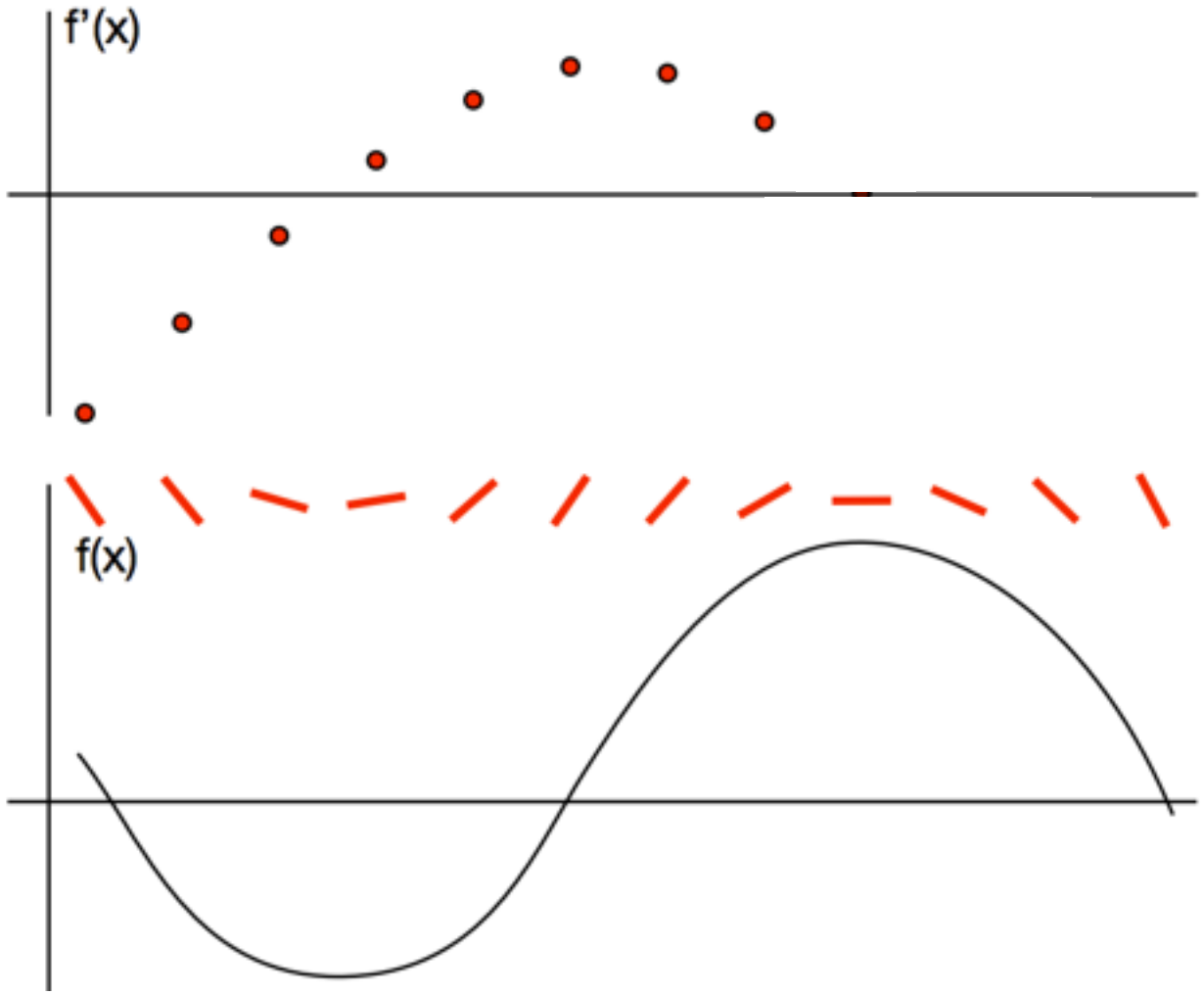

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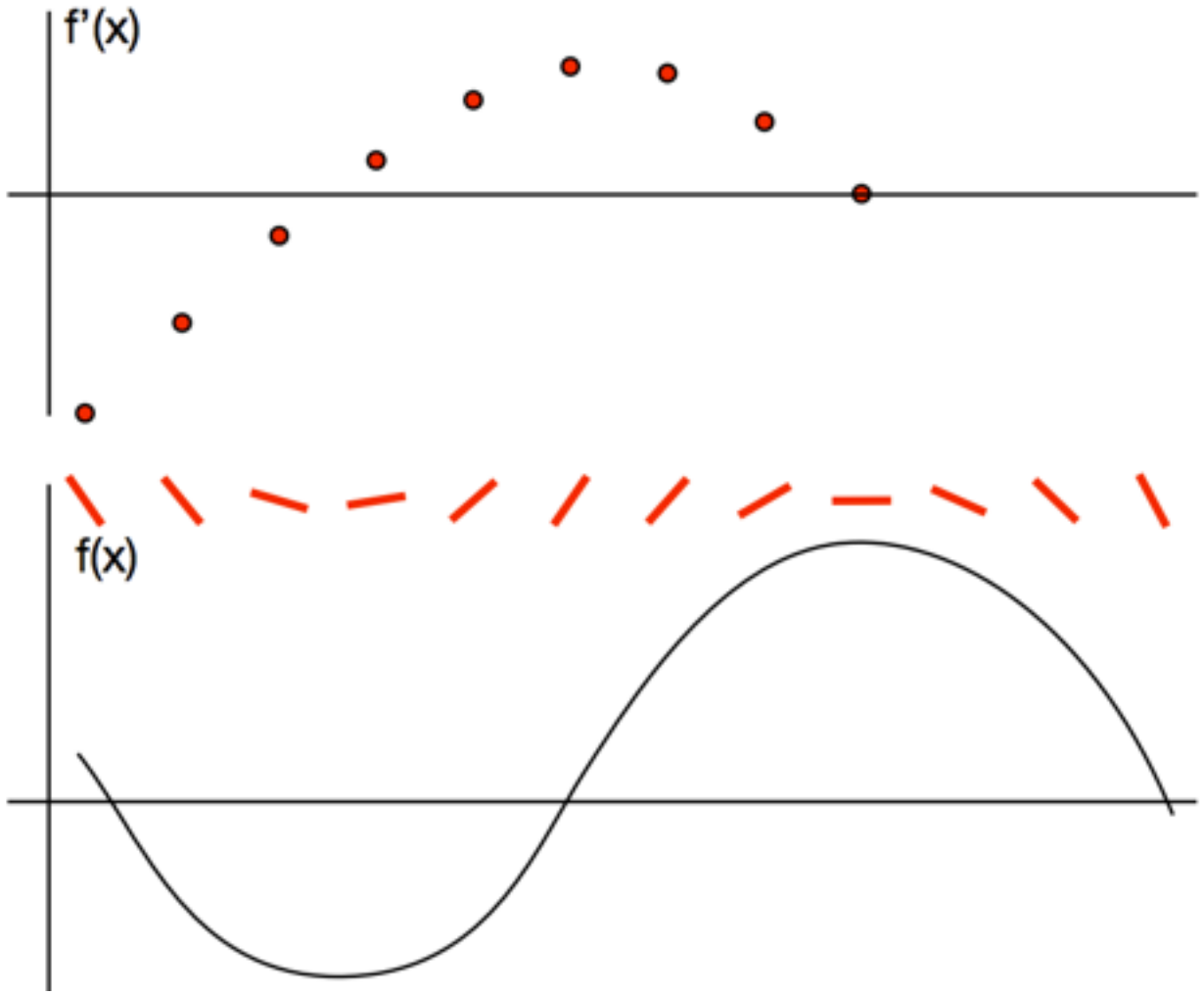

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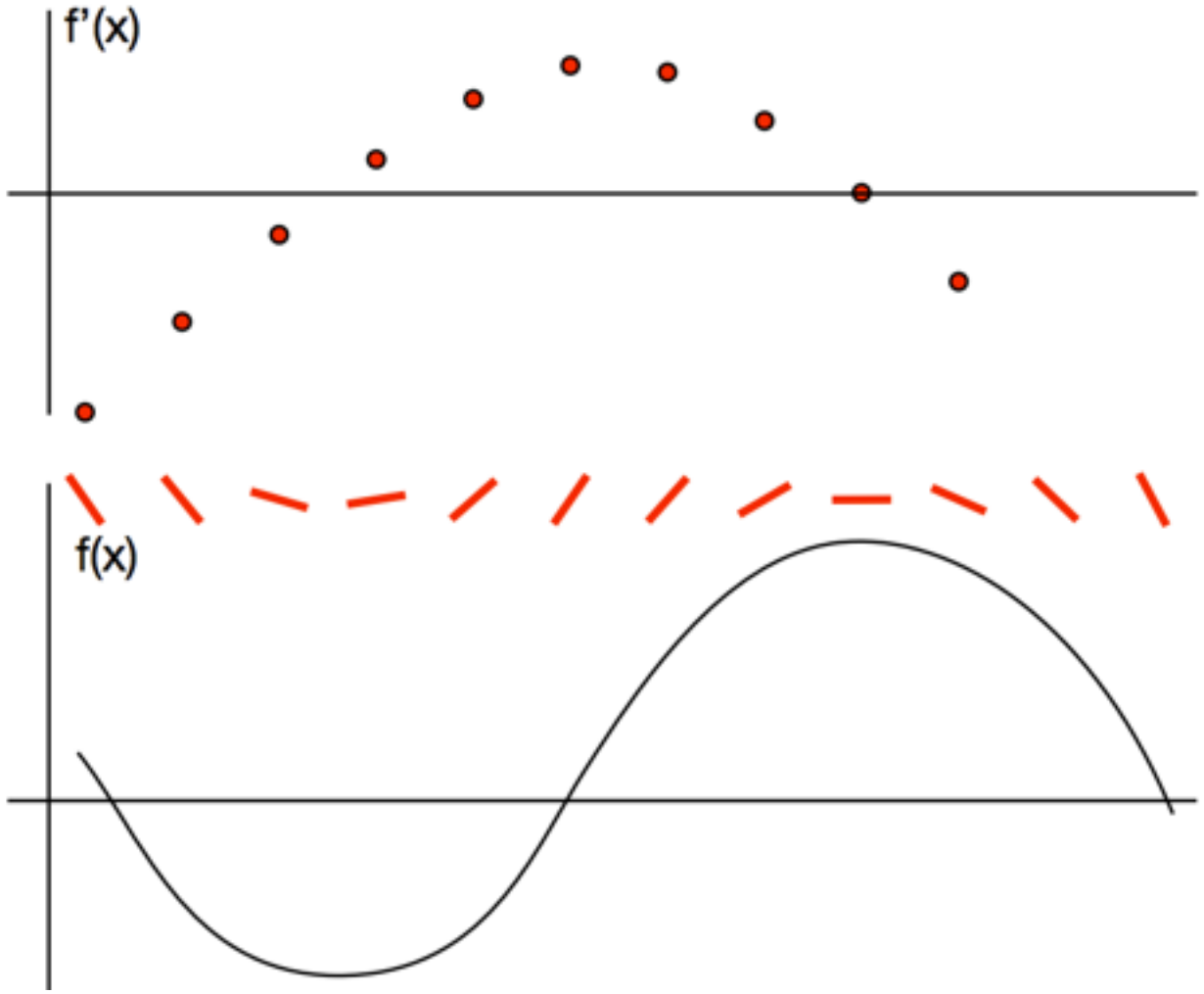

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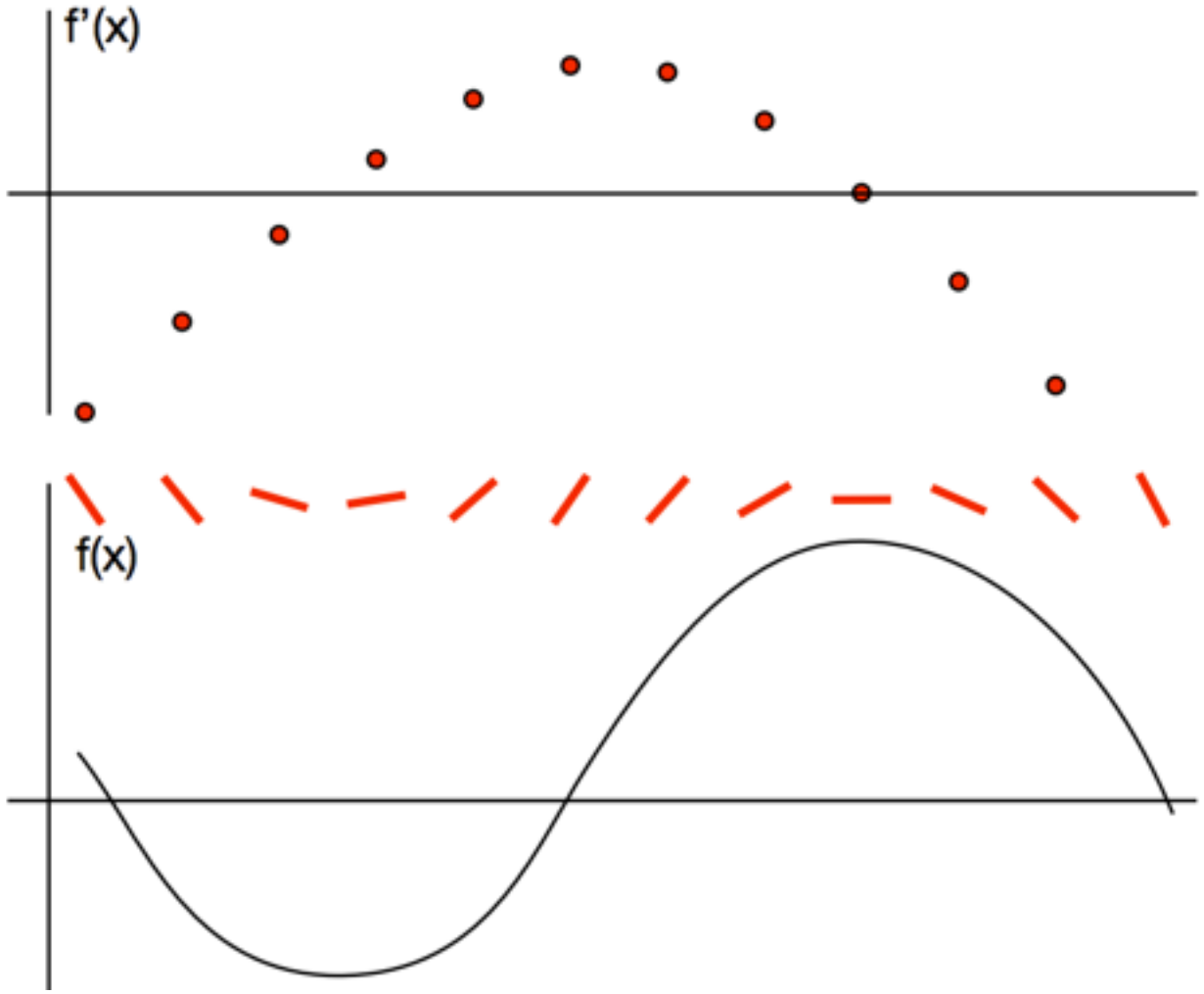

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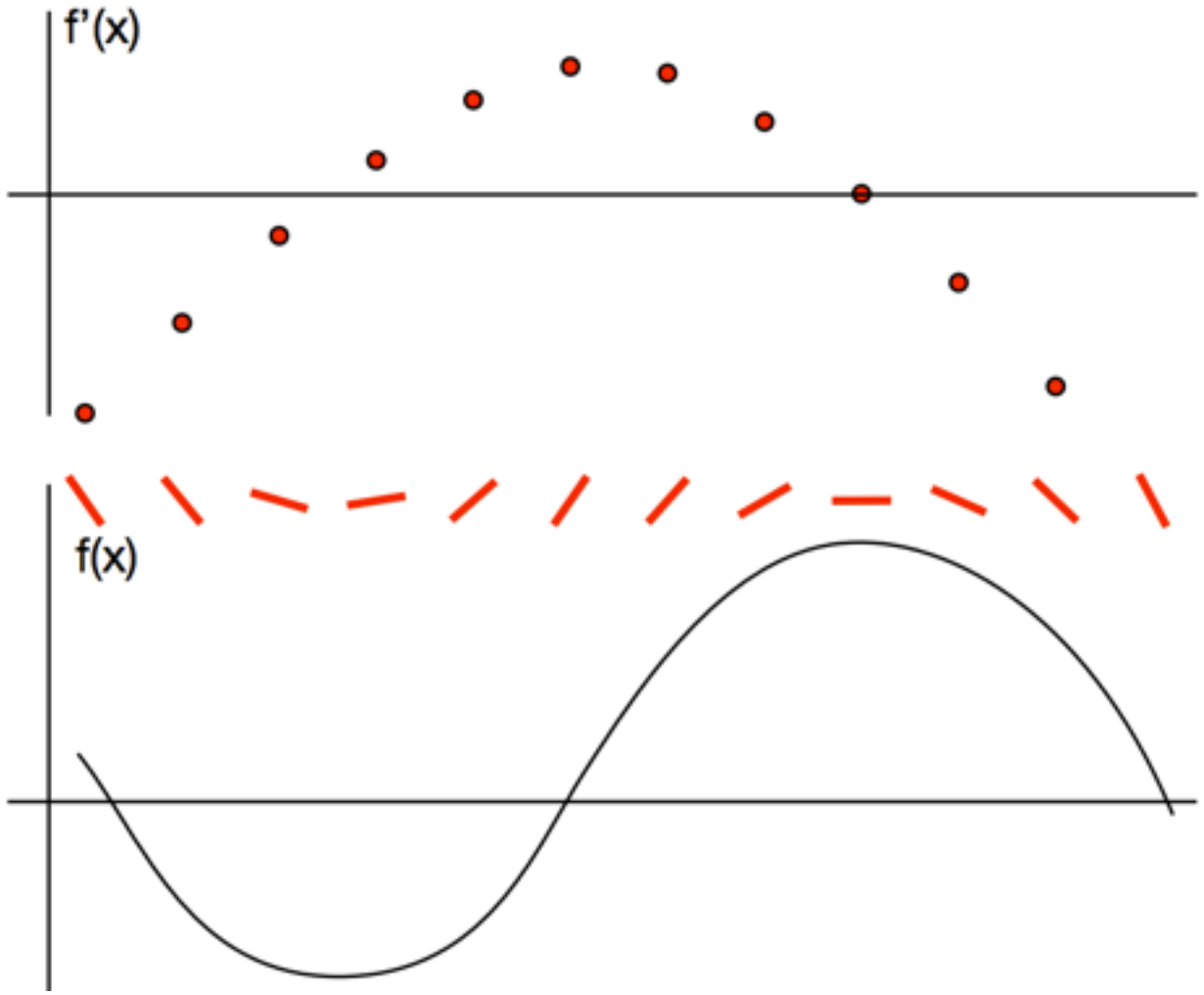

Graph of the derivative

When f takes a maximum or a minimum, then f’ should be zero?

(A) True (B) False (C) Don’t know

When f’ takes a maximum or a minimum, then f should be zero?

(A) True (B) False (C) Don’t know

When f’ takes a zero, then f should be at a maximum or a minimum?

(A) True (B) False (C) Don’t know

See you on Thursday!

PL3.2: Sept 21

WW2: Sept 22

Quiz1: Sept 22
If you have problem with secretive come and talk to me!