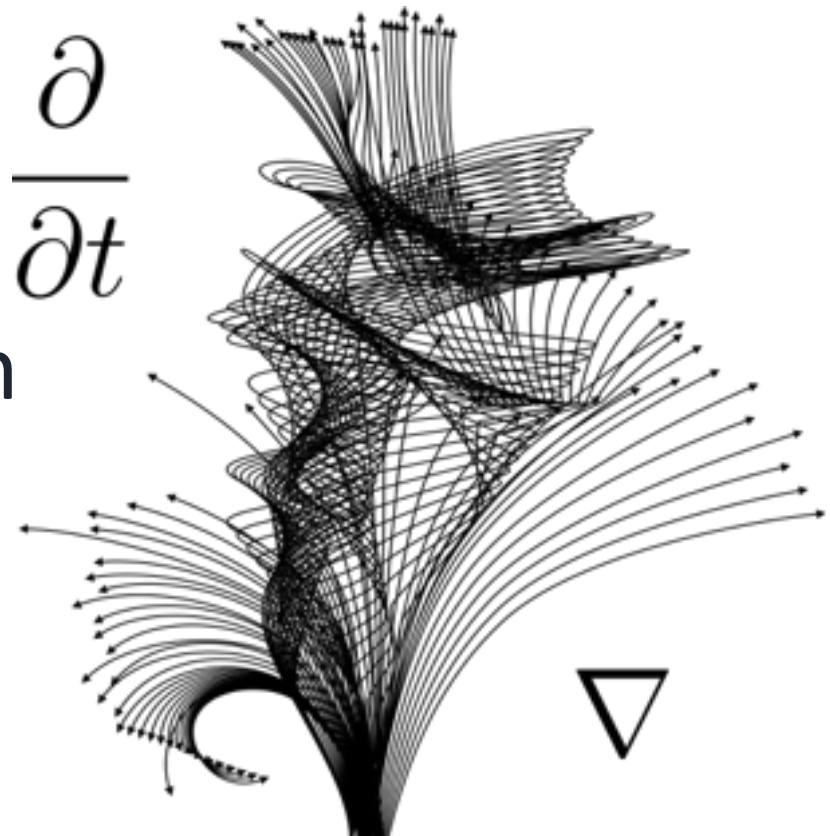
Differential Calculus with Applications to Life Sciences

Math 102:105

Pooya Ronagh

Agenda for today:

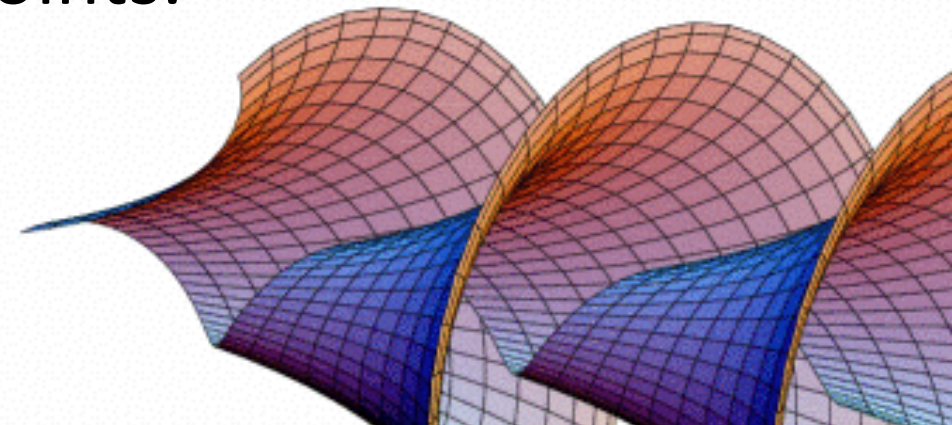
- Graph of the derivative as a function
- Sum, product, quotient rules



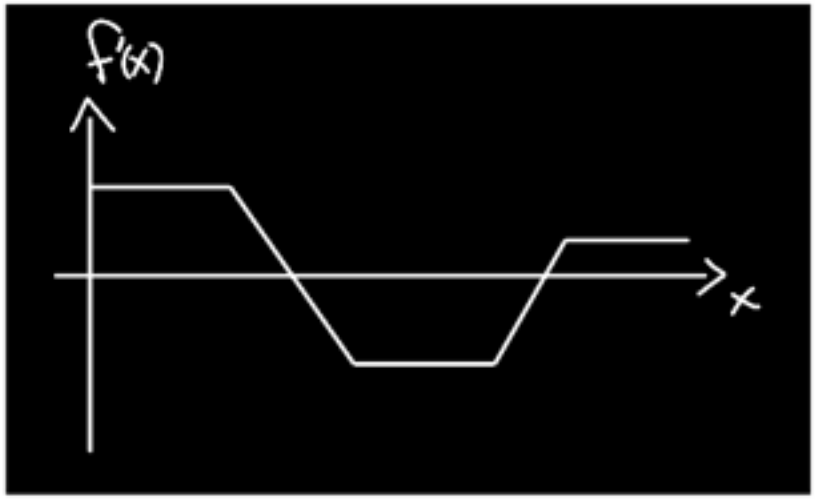
Last time…

For a differentiable function y = f(x)

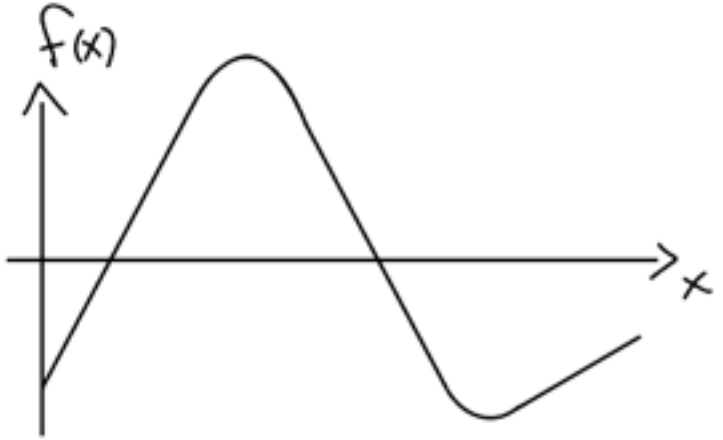
- min/max points of f(x) imply f’(x)=0
  If we find all points with f’(x)=0,
  max/min points are among them!!
- Inverse is not true!
  Not all f’(x)=0 are max/min points.
- max/min points of f’(x) imply what?



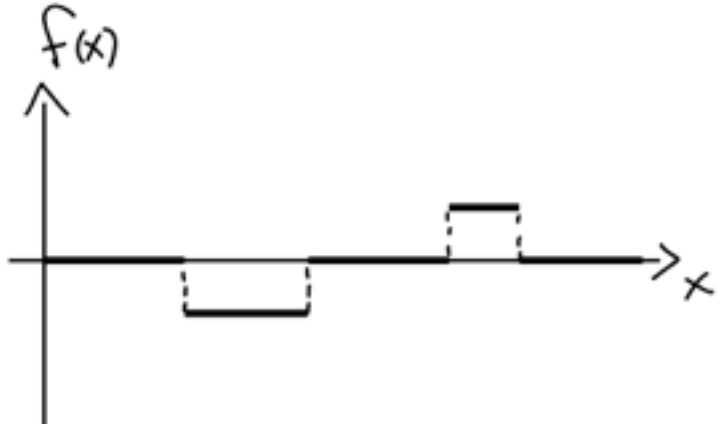
Graph of f(x) from f’(x)



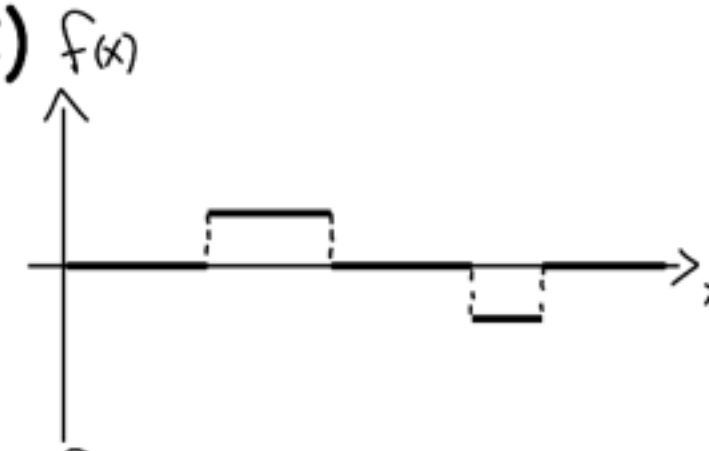
(A)



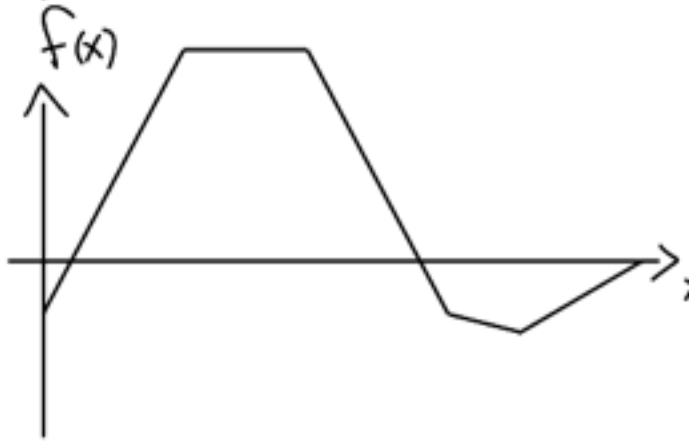
(B)



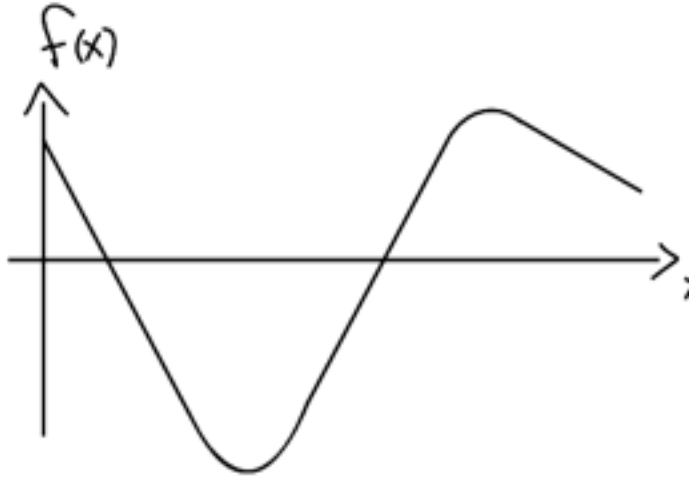
(C)



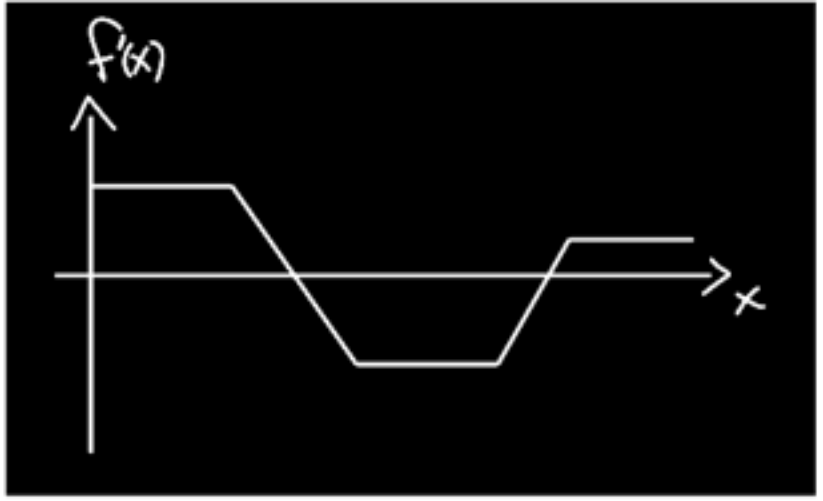
(D)



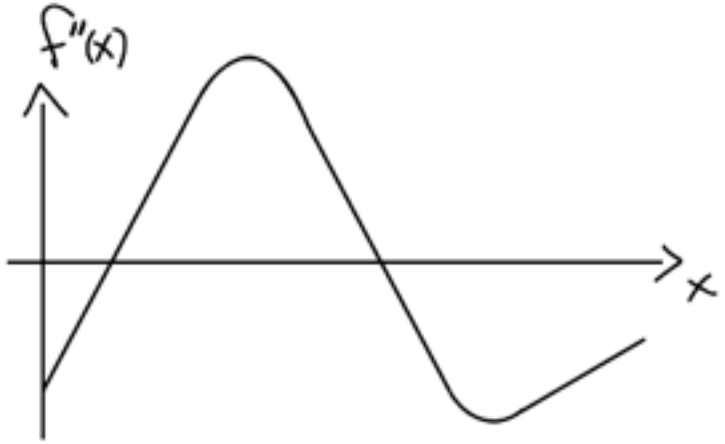
(E)



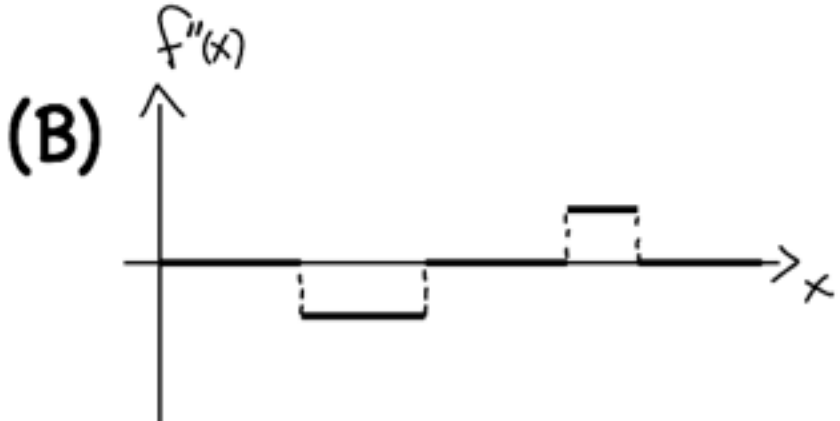
Graph of f’’(x) from f’(x)



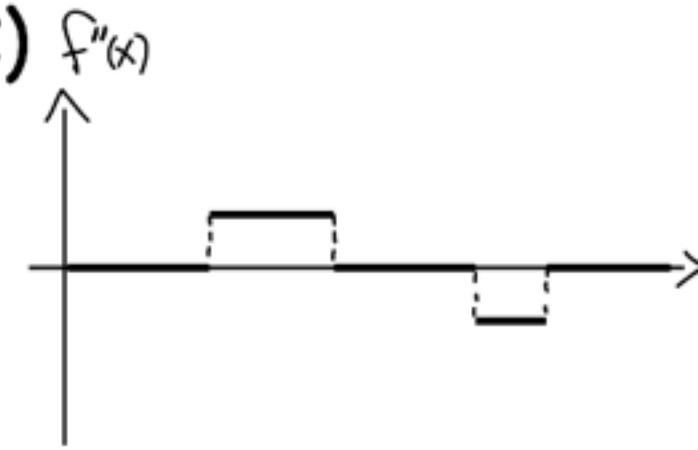
(A)



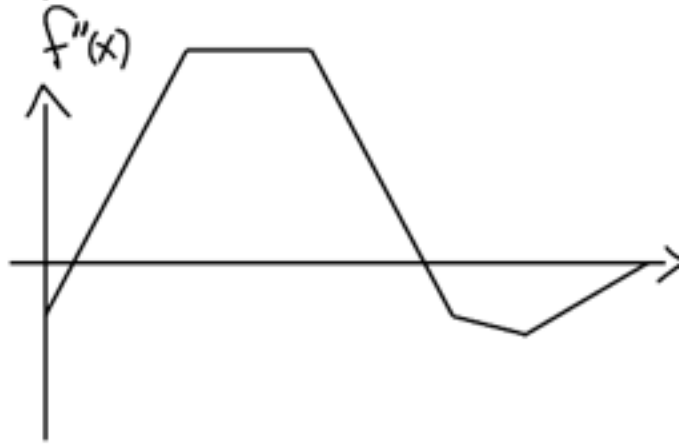
(B)



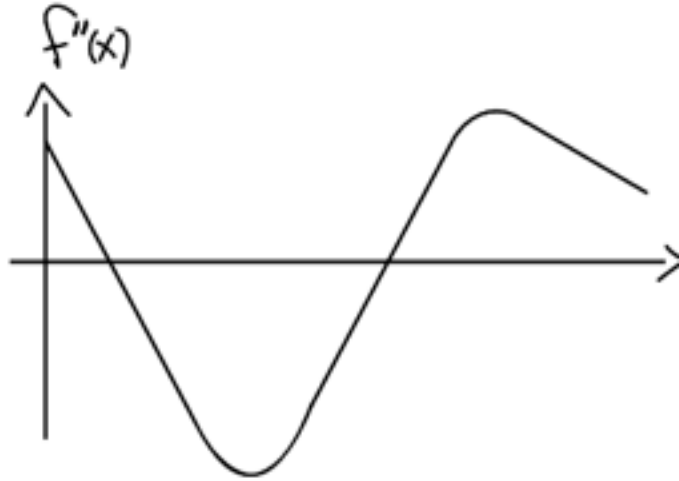
(C)



(D)



(E)



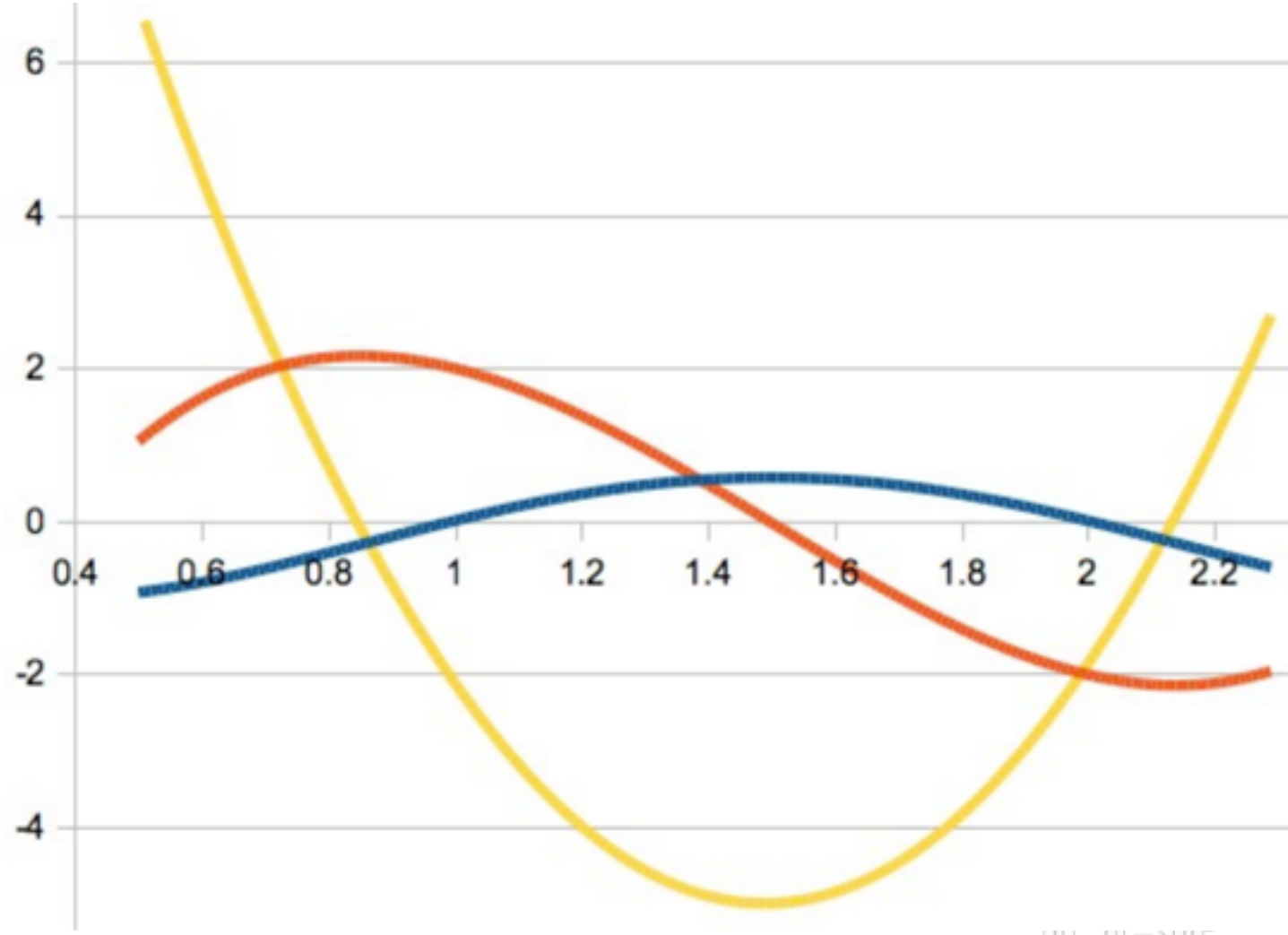
Displacement, velocity, acceleration

(A) x, v, a

(B) v, x, a

(C) a, v, x

(D) a, x, v



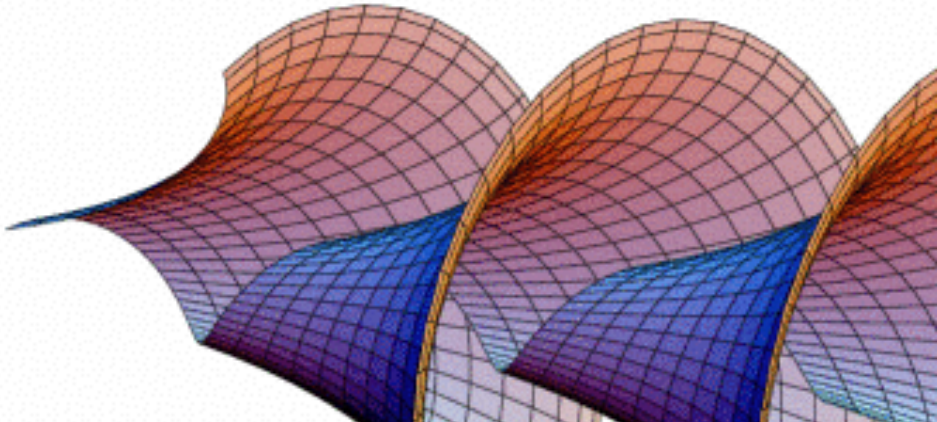
More graphing f’ from f

Examples:

$$f(x) = x\sin(x)$$

$$f(x) = e^{-x^2}\sin(x)$$

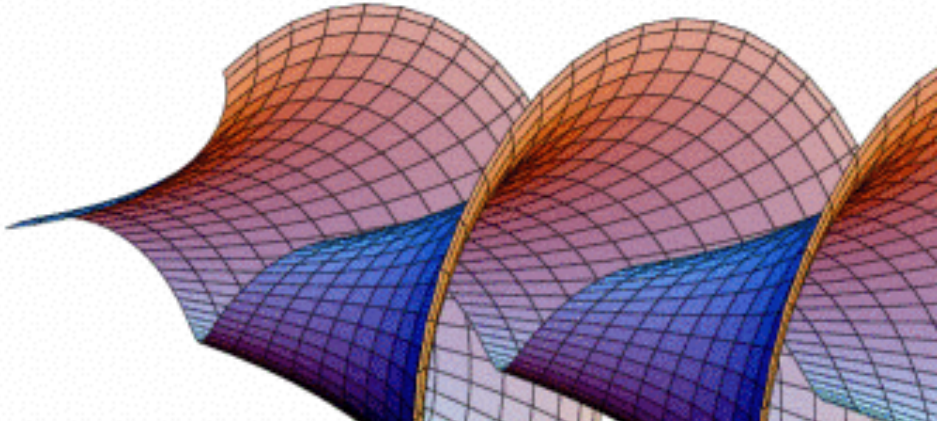
$$f(x) = |\sin(x)|$$



More graphing f’ from f

Hints:

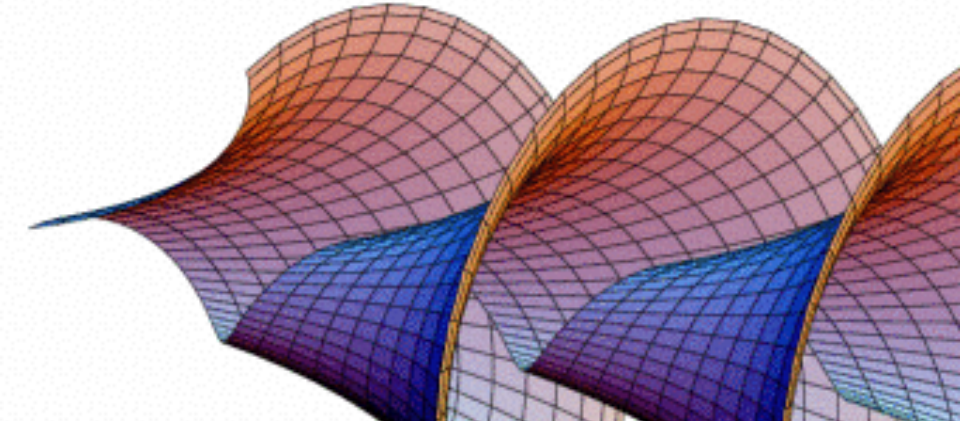
- f(x) is odd, then f’(x) is even, and vice versa.
- min/max of f(x), are roots of f’(x)
- for now min/max of f’(x) are just estimations.



Power rule

$$f(x) = x^n$$

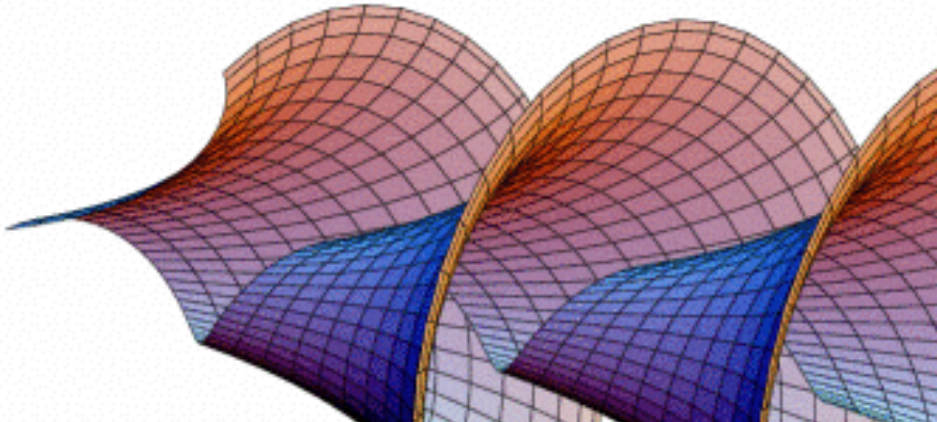
$$f'(x) = nx^{n-1}$$



Summation rule

$$(f(x) + g(x))' = f'(x) + g'(x)$$

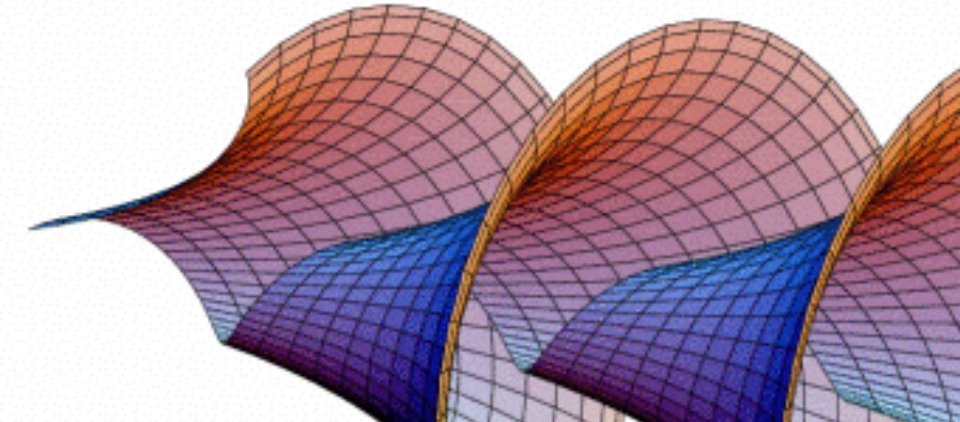
Question: Verify this using the definition of the derivative.



Product rule

$$(f(x)g(x))' = f'(x)g(x) + f(x)g'(x)$$

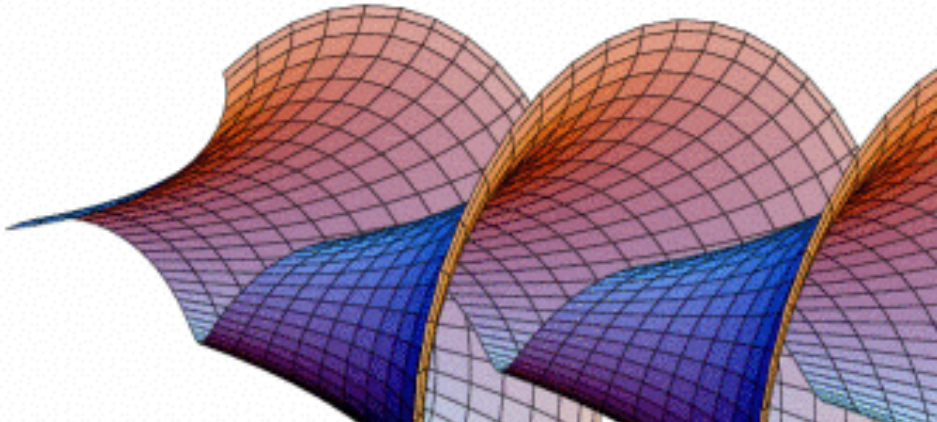
Bonus: Verify this using the definition of the derivative.



Quotient rule

$$\left(\frac{f(x)}{g(x)}\right)' = \frac{g'(x)h(x) - g(x)h'(x)}{h(x)^2}$$

$$\left(\frac{u}{v}\right)' = \frac{u'v - v'u}{v^2}$$



Before we go to quiz:

Remember:

PL4.1: Sept 26