The second derivative

MTH 201 -- Module 3B part 2

Retrieval practice

When poll is active, respond at **PollEv.com/talbert**
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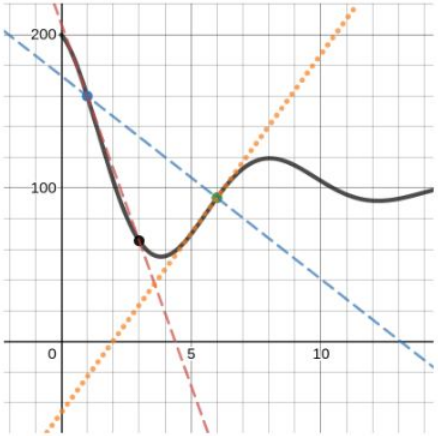
Which of the following quantities is/are negative in this picture? Select all that apply.



- The average rate of change in s on $[1, 3]$
- The average rate of change in s on $[1, 6]$
- The instantaneous rate of change in s at $t = 6$
- There's not enough information present to decide
- (Select this option if none of the above is true)

Tc 0

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Poll locked. Responses not accepted.

The derivative $f'(a)$ tells you

- The instantaneous rate of change in f(x) at x = a
- The slope of the tangent line touching the graph of f(x) at x = a
- The slope of the secant line connecting x = 0 and x = a on the graph of f(x)
- Both (a) and (b)

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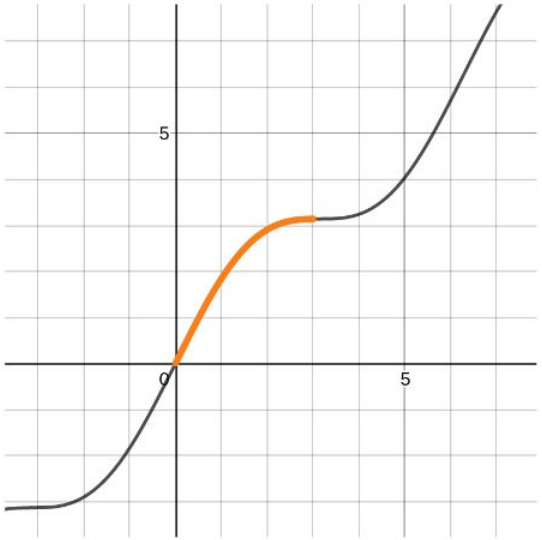
On the section of the graph of $y = f(x)$ from 0 to 2 (colored orange),



- f is increasing and concave up
- f is increasing and concave down
- f is decreasing and concave up
- f is decreasing and concave down

To 0

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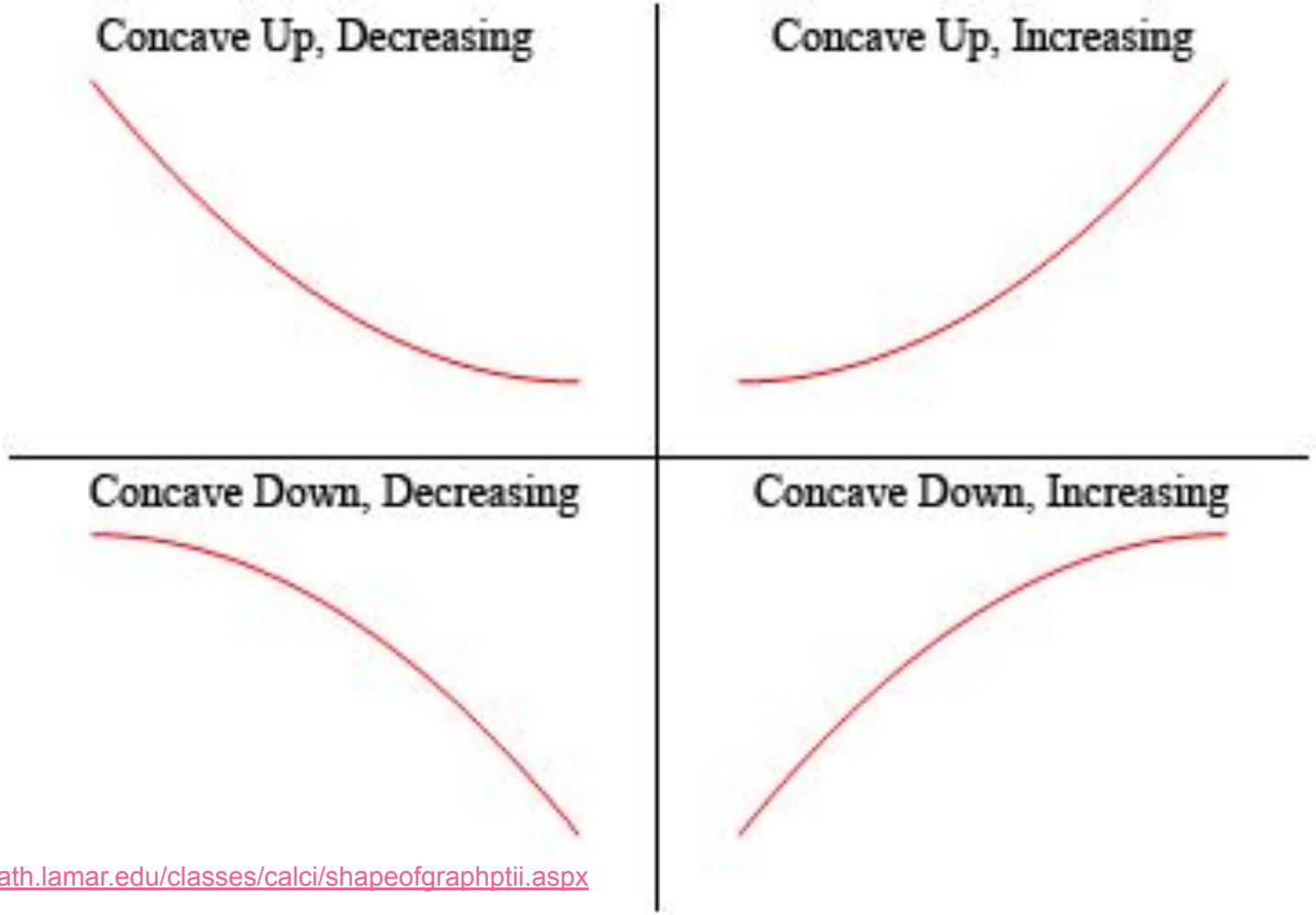
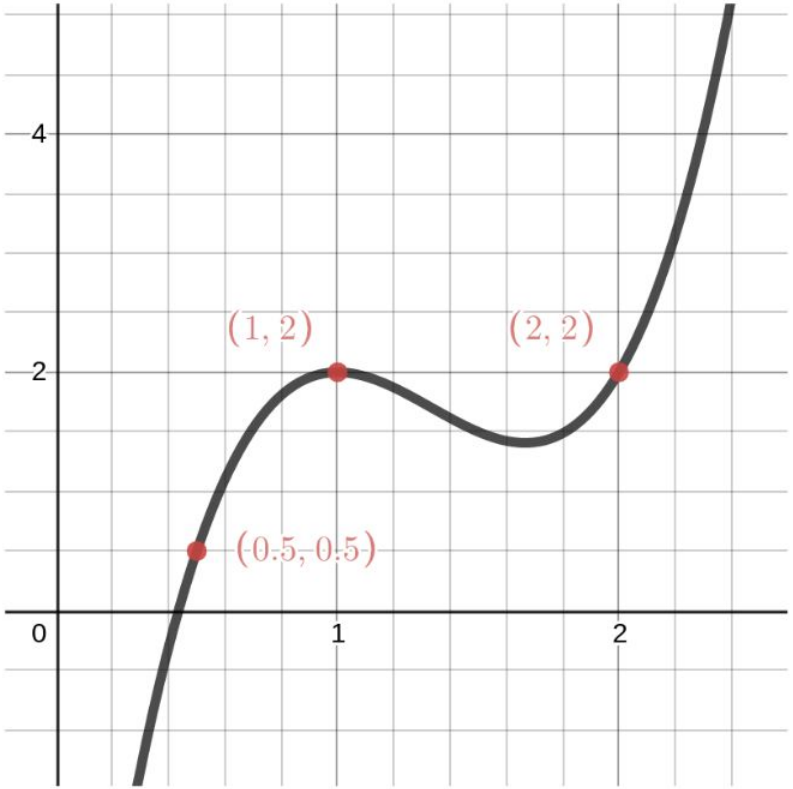


https://tutorial.math.lamar.edu/classes/calci/shapeofgraphptii.aspx

Connecting this to the second derivative

The graph of $y = g(x)$ is shown. At the point $(0.5, 0.5)$,



$g' > 0$ and $g'' > 0$

$g' > 0$ and $g'' < 0$

$g' < 0$ and $g'' > 0$

$g' < 0$ and $g'' < 0$

To 0

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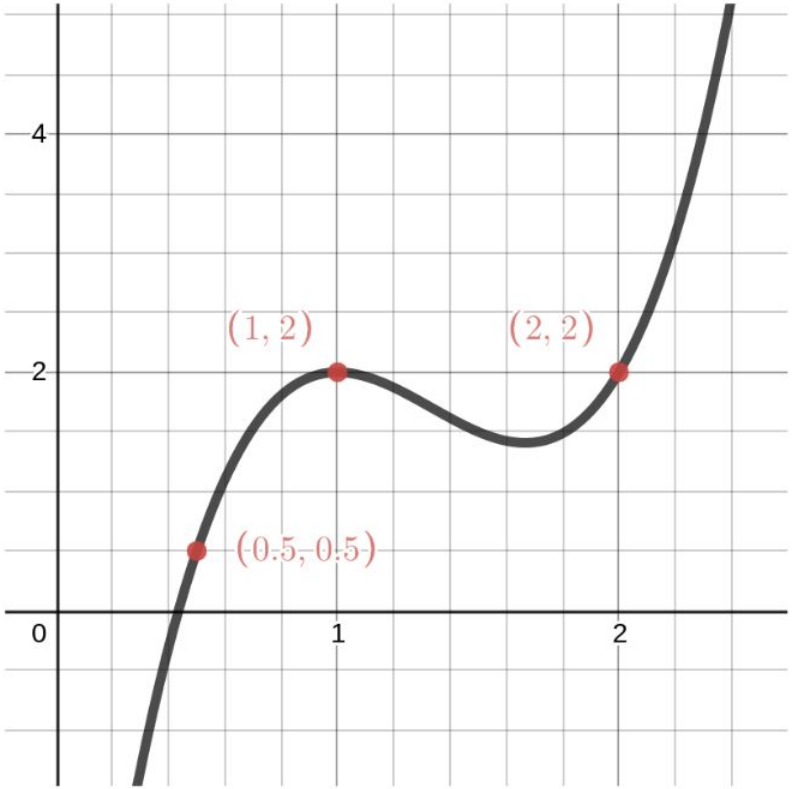
The graph of $y = g(x)$ is shown. At the point $(2, 2)$,



$g' > 0$ and $g'' > 0$

$g' > 0$ and $g'' < 0$

$g' < 0$ and $g'' > 0$

$g' < 0$ and $g'' < 0$

To 0

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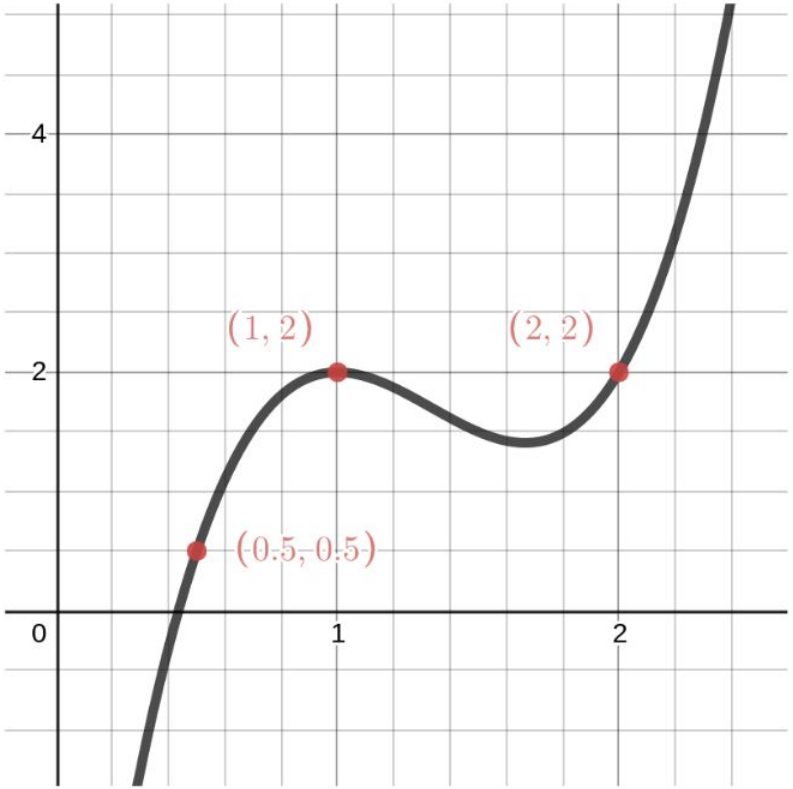
The graph of $y = g(x)$ is shown. Based on the graph,



$g''(1) = 0$

$g''(1) < 0$

$g''(1) > 0$

None of the above

To 0

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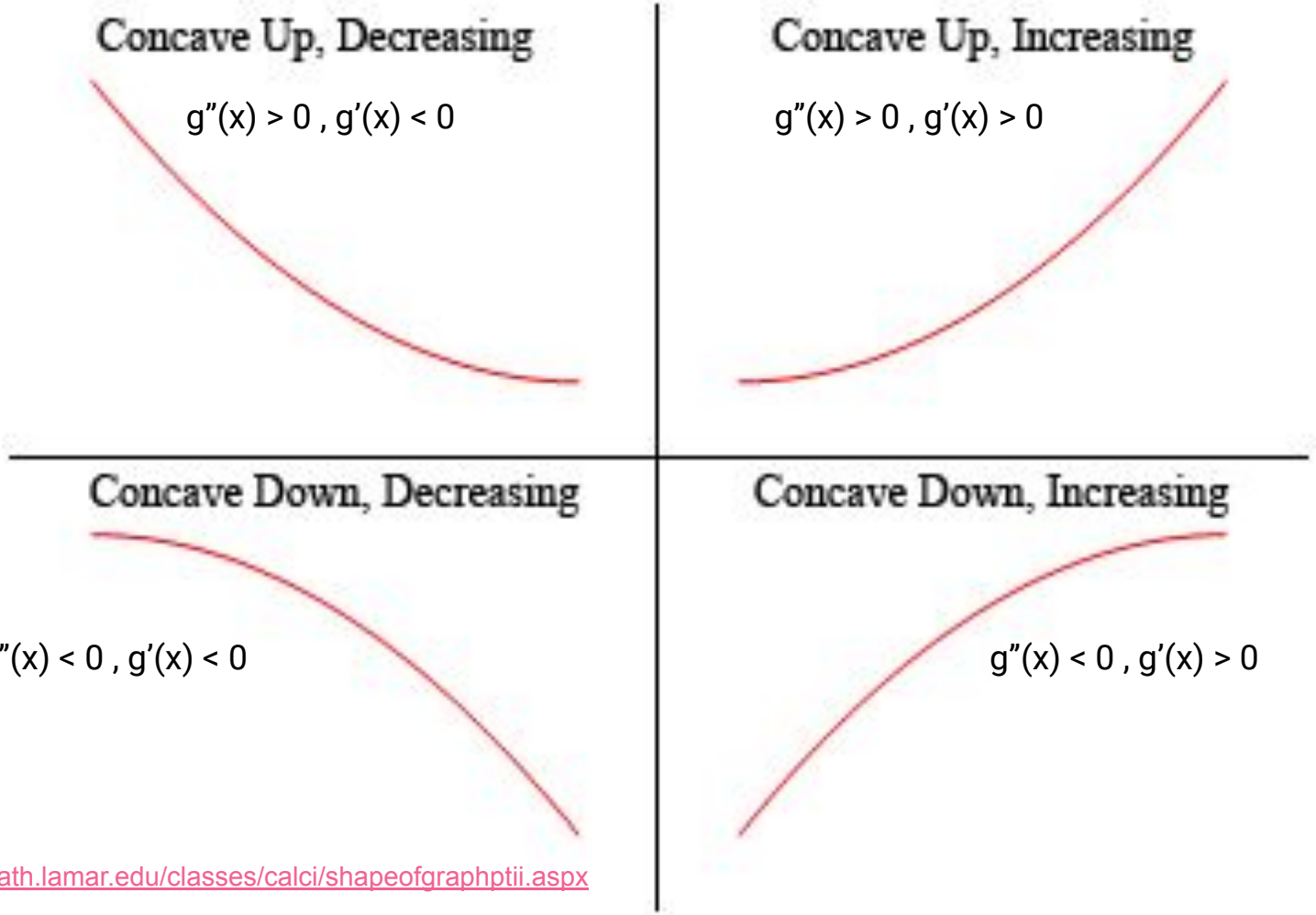
The second derivative f”(x) of a function f(x) is…

→ The derivative of f’(x)

→ The rate at which f’(x) is changing

Concave up →
Rate of change is increasing →
f’(x) is increasing →
f”(x) is positive

Concave down →
Rate of change is decreasing →
f’(x) is decreasing →
f”(x) is negative



https://tutorial.math.lamar.edu/classes/calci/shapeofgraphptii.aspx

Connecting this to position and velocity

- Suppose s(t) tells you the position of a moving thing at time t.
- We already know s’(t) tells you **velocity**.
- s”(t) would tell you the *rate of change* in velocity
- What does it look/feel like when you change velocities? https://youtu.be/j13qLByE4hw?t=31
- s”(t) tells you **acceleration.**

Desmos activity: Concavity and the second derivative

Feedback:
http://gvsu.edu/s/1zJ