MTH 201: Calculus

Module 3A: Interpreting, estimating, and using the first and second derivatives

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GVSU

August 10, 2020

Agenda for today

- Review of Daily Prep assignment, and Q+A

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- Followup activities and things to do

Review and Q+A

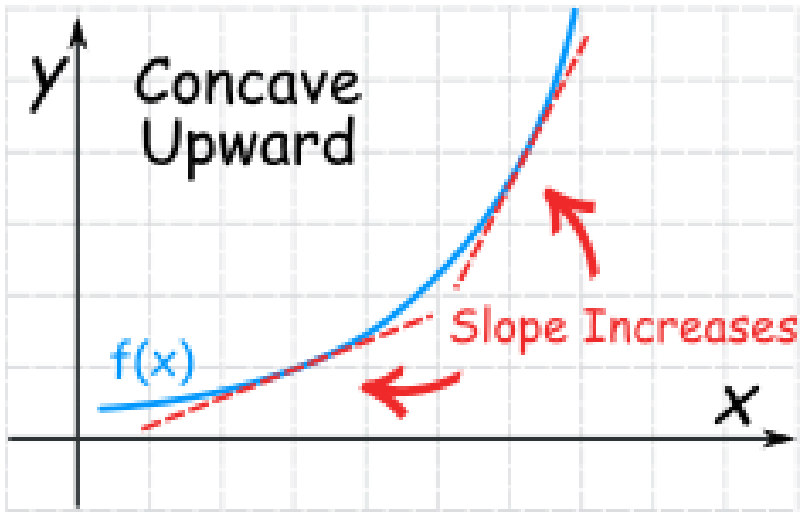
Go to `www.menti.com` and use code ?

Concavity

Definition: Concave up

A function f is **concave up** on an interval if

- f is either increasing or decreasing at an increasing rate on the interval
- The graph of f sits above its tangent lines on the interval
- f' is increasing on the interval

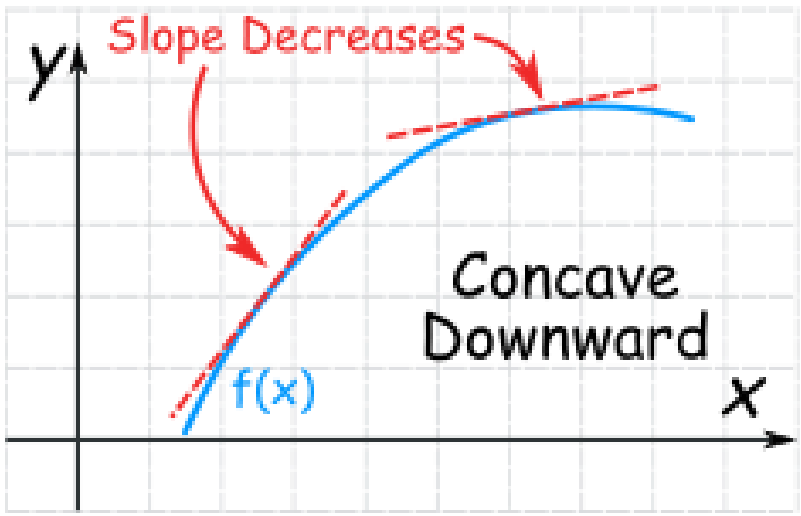


Concavity

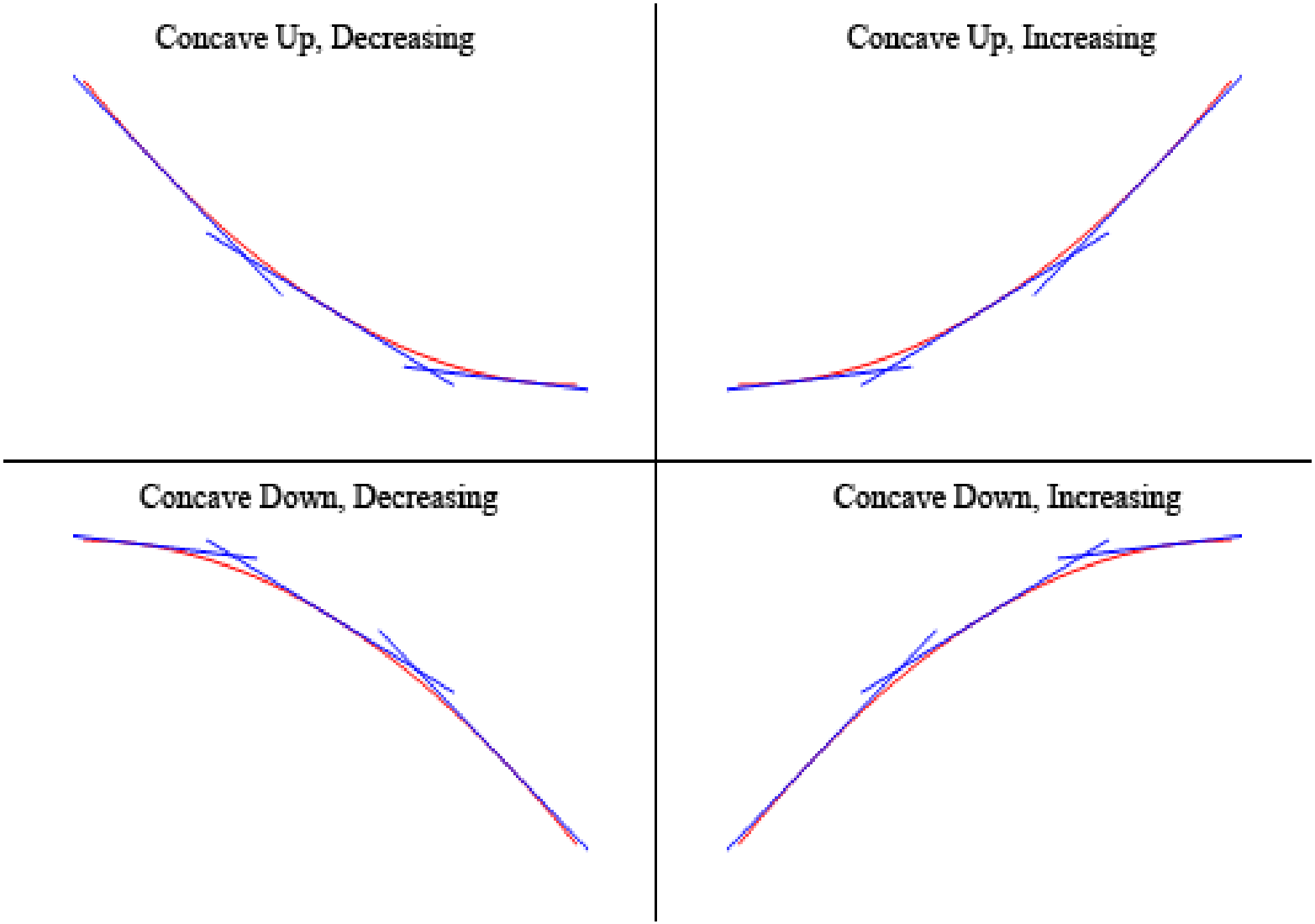
Definition: Concave down

A function f is **concave down** on an interval if

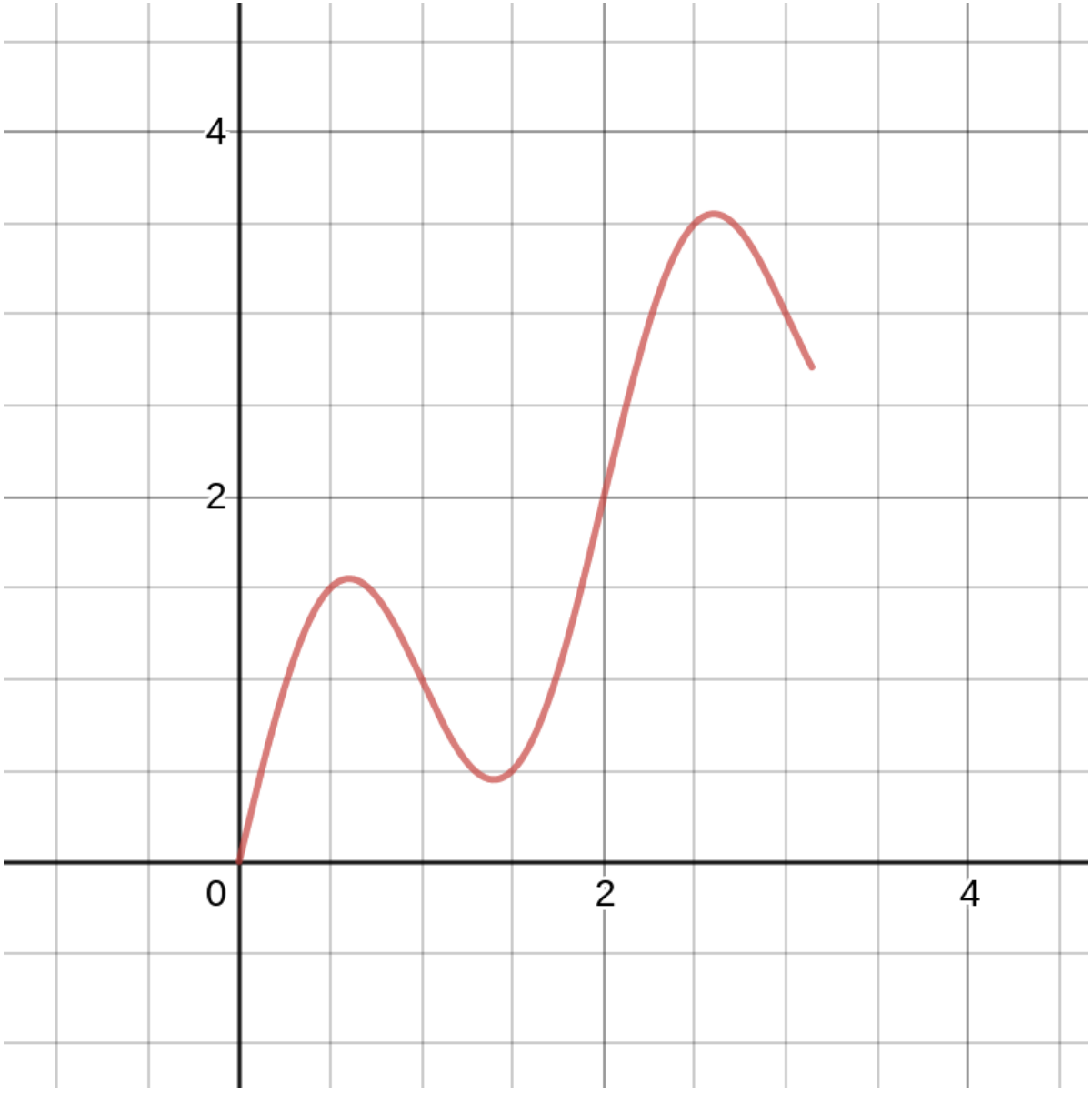
- f is either increasing or decreasing at an decreasing rate on the interval
- The graph of f sits below its tangent lines on the interval
- f' is decreasing on the interval



Four combinations of behaviors



Identifying concavity



The second derivative

The second derivative

The **second derivative** of a function f is the derivative of its derivative.

Notation: $f''(x)$ or $\dfrac{d^2y}{dx^2}$

The second derivative tells you **the rate at which the slopes of f are changing**

Or, **whether f' is increasing or decreasing**

Connecting some pieces

- f is concave up if f' is increasing

Connecting some pieces

- f is concave up if f' is increasing
- f' is increasing if the derivative of f' is positive

Therefore... f is concave up if

Connecting some pieces

- f is concave up if f' is increasing
- f' is increasing if the derivative of f' is positive
- The derivative of f' is f''

Therefore... f is concave up if

Next

All due dates are on the Course Calendar

- Complete Followup Activities