ACE Calculus – Mr. Bo
Unit 3A – Day 4 Notes v3

Name___________________________________
Date:___________________

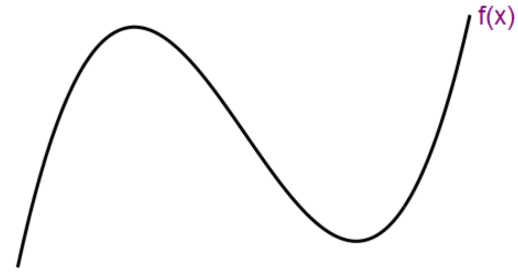
The Second Derivative Test for Relative Extrema

Concavity & Points of Inflection

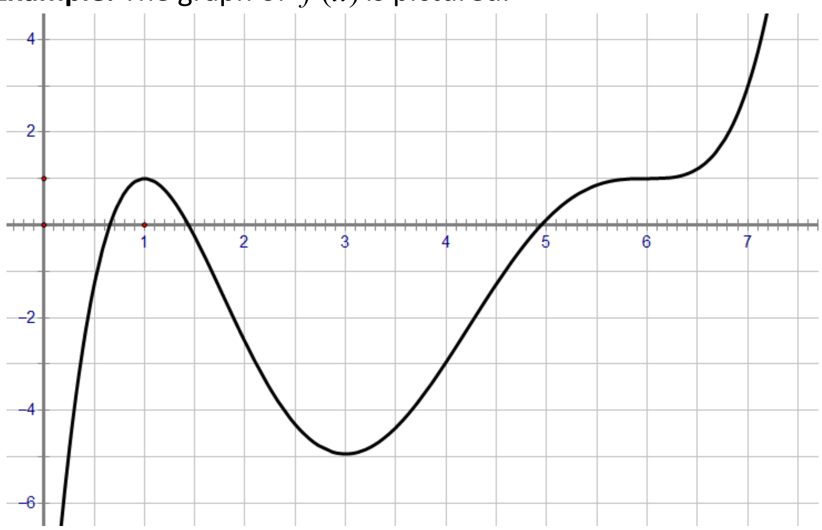
Concave Down – A curve whose slope is __________________

Concave Up – A curve whose slope is _____________________

Inflection Point - _______________________________________



Example: The graph of $f(x)$ is pictured.



a. Identify the intervals where f is cc-up.

b. Identify the intervals where f is cc-down.

c. Identify any points of inflection.

Concavity & the Second Derivative

Concave Down – If slope of $f(x)$ is **Decreasing**,

then $f'(x)$ is ____________________

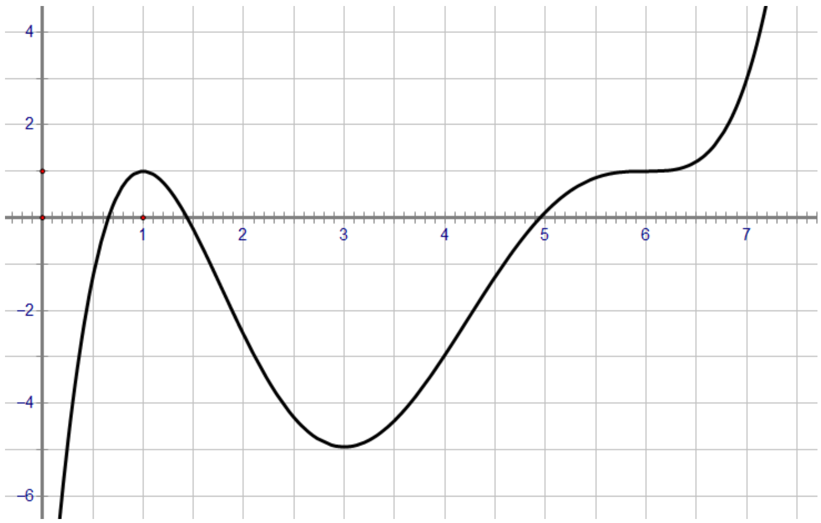
and $f''(x)$ is _____________________

Concave Up – If slope of $f(x)$ is **Increasing**,

then $f'(x)$ is ____________________

and $f''(x)$ is _____________________

Example: The graph of $f(x)$ is pictured.

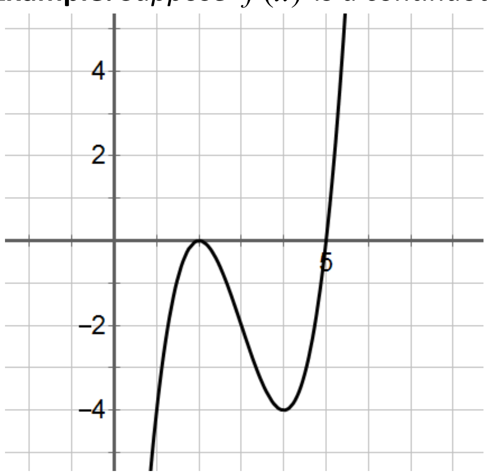


a. Identify the intervals where $f''(x)$ is positive.

b. Identify the intervals where $f''(x)$ is negative.

c. Identify any points where $f''(x) = 0$.

Example: *Suppose $f(x)$ is a continuous function. The graph of $f'(x)$ is pictured.*



a. Identify the intervals where $f(x)$ is cc-up.

b. Identify the intervals where $f(x)$ is cc-down.

c. Identify any points of inflection.

Example: Determine the intervals where the function is cc-up/dn and any points of inflection.

$$f(x) = x^6 - 5x^4$$

The Second Derivative Test for Relative Extrema:

If $f(x)$ is a function such that $f'(c) = 0$ and $f''(c)$ exists on an open interval containing c, then:

1. $f(c)$ is a Rel. Min. if:

2. $f(c)$ is a Rel. Max. if:

Example: Find the relative extrema using the 2nd derivative test.

$$f(x) = x^6 - 5x^4$$

Example: Find the relative extrema using the 2nd derivative test.

$$f(x) = -3x^5 + 5x^3$$