5.3 Local Extrema & Concavity

CONCAVITY

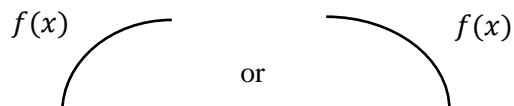✱ f is concave up

$f(x)$ ⌣ or ⌣ $f(x)$
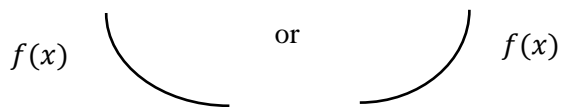
f is concave up → →

✱ f is concave down

$f(x)$ ⌢ or ⌢ $f(x)$

f is concave down → →

Test for Concavity

Must be able to get a 2nd derivative, f'', on (a, b).
① Find where $f'' = 0$ or f'' DNE

② If $f'' > 0$, then f is

If $f'' < 0$, then f is

③ Inflection points occur where concavity changes

Example 1
Find where $h(x) = 3x^2 - x^3$ is concave up and concave down and the inflection point(s) of $h(x)$ (if any).

Example 2

Find where $g(x) = xe^x$ is concave up and concave down and the inflection point(s) of $g(x)$ (if any).

Example 3

Find where $f(x) = x^{2/3}$ is concave up and concave down and the inflection point(s) of $f(x)$ (if any).