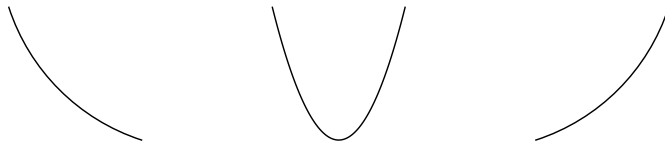# Second Derivatives

Study Guide

1. Second Derivatives and Concavity

The **second derivative** f'' is just the derivative of the derivative. When the second derivative is positive, the corresponding graph is **concave up**:

When the second derivative is negative, the corresponding graph is **concave down**:

A point where the graph switches between concave down up and concave down (i.e. the second derivative switches between positive and negative) is a **point of inflection**:

Problems: Section 4.4 # 1, (5), 13, 15, (17), (23), 103, 109, 111

2. The Second Derivative Test

You can use the second derivative to determine the type of a critical point. Suppose $f(x)$ has a critical point at $x = a$.

(a) If $f''(a) > 0$, then f has a local min at $x = a$.

(b) If $f''(a) < 0$ then f has a local max at $x = a$.

(c) If $f''(a) = 0$, then f could have any kind of critical point at $x = a$ (local max, local min, or neither).