Section #4.2 Inflection points
MATH 2313

Second Derivative Test (to determine concavity)

1. Take 2nd derivative
2. Set \( f''(x) = 0 \)
   Solve for \( x \) (possible inflection point)
3. Test
   - If \( f''(x) > 0 \) then \( f(x) \) is concave up
   - If \( f''(x) < 0 \) then \( f(x) \) is concave down

Def: Inflection Point is a point where the graph changes concavity.

1. Find the concavity for \( f(x) = x^2 - 6x + 8 \)

FACT: A function \( f \) has an inflection point at \( p \) if:

- \( f' \) has a local min/max at \( p \)
- \( f'' \) changes signs at \( p \)

2. Find where \( f(x) \) is concave up, concave down, and inflection point(s) \( f(x) = x^3 - x^2 - x + 1 \)

3. \( f(x) = 24x^3 - 26x^2 + 9x - 1 \)

4. \( f(x) = (x - 2)^3 + 1 \)

5. \( f(x) = e^{-x^2} \)
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6. Consider the graph below.

(a) If the graph is \( f(x) \), how many inflection points does it have? (Mark them with a dot.)

(b) If the graph is \( f'(x) \), how many inflection points does \( f(x) \) have? (Mark them with a square.)

(c) If the graph is \( f''(x) \), how many inflection points does \( f(x) \) have? (Mark them with a triangle.)

7. Consider the graph below.

(a) If the graph is \( f(x) \), how many inflection points does it have? (Mark them with a dot.)

(b) If the graph is \( f'(x) \), how many inflection points does \( f(x) \) have? (Mark them with a square.)

(c) If the graph is \( f''(x) \), how many inflection points does \( f(x) \) have? (Mark them with a triangle.)

8. For the following graphs, identify the critical points (Mark them with a dot), the local maxs and mins, (Mark them with a square), and the inflection points (Mark them with a triangle), of the function \( f(x) \).