3.2 Extrema & Function Analysis

**Absolute max/min** – absolutely the highest or lowest point.

**Absolute max/min** – a point on the function that is higher or lower than all the points immediately surrounding it.

Finding a max/min means finding the y-value of the point. The x-value helps you with location of the point, but it is not the max/min value.

1. Find the coordinate points of the extrema of each function and classify its type.
   
   \[ f(x) = 0.05x^6 - 0.25x^5 - 0.25x^4 + 2.25x^3 - 5.4x^2 + 1 \]
   
   **Local Min**: @ (-0.583, 41.337)
   **Local Max**: @ (0, 1)
   **Abs Min**: @ (4.168, -57.67)

   What is the minimum value of \( f \)? \(-57.67\)

2. Closed Endpoint:

3. Open Endpoint:

3. Jump Discontinuity
3.2 Extrema & Function Analysis

   \[ f(x) = -100x^3 - 45x^2 + 10x + 5000 \]

**Function Analysis** – putting it all together!

5. \[ f(x) = 0.5(x^2 + 1)\sqrt{4-x} \]
   - **Domain:** \([4, \infty)\)
   - **Vertical Asymptotes:** (Nonremovable) \[ \text{NONE} \]
   - **Holes:** (Removable) \[ \text{NONE} \]
   - **Absolute max/min value:** \[ \text{NONE} \]
   - **Local max/min value(s) that are NOT absolute:** 
     - Local MIN of 0.996
     - Local MAX of 5.035
   - **Increasing:** \((0.064, 3.136)\)
   - **Decreasing:** \((-\infty, 0.064) \cup (3.136, \infty)\)
   - **Left End-Behavior:** \( \lim_{x \to -\infty} f(x) = \infty \)
   - **Right End-Behavior:** \( \lim_{x \to \infty} f(x) = -\infty \)

**Sketch a graph:**

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**Skills Review:** Solve or evaluate.

1. \[ \sqrt{-125} = 5i \]
2. \[ x^2 + 1 = 73 \]
   \[ x^2 = 72 \]
   \[ x = \pm \sqrt{72} \]
   \[ x = \pm 6\sqrt{2} \]
3. \[ -9(x + 7)^2 = -144 \]
   \[ (x + 7)^2 = 16 \]
   \[ x + 7 = \pm 4 \]
   \[ x = -1, -3 \]
4. \[ 5(x - 2)^2 = -60 \]
   \[ (x - 2)^2 = -12 \]
   \[ x - 2 = \pm \sqrt{-12} \]
   \[ x = 2 \pm 2i\sqrt{3} \]