

Determine Concavity and POI's

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To find the intervals of concavity for a function y :

1. Find y'' then find where $y'' = 0$ or where y'' is undefined. (PPOI's)
2. Put these PPOI's on a number line and test a number within the intervals into y'' .
3. If $y'' > 0$, then y is concave up. If $y'' < 0$, then y is concave down.

A point where the graph of a function has a tangent line and where the concavity changes is a **point of inflection** (POI).

**1. The graph of $y = 3x^4 - 16x^3 + 24x^2 + 48$ is concave down for what intervals?

2. For $f(x) = \sin(x) + 2$ on $[0, 3\pi]$ determine the a) intervals where $f(x)$ is concave up and justify b) point(s) of inflection and justify.

3. Determine the intervals where $g(x) = \sqrt[3]{2x - 1}$ is concave down and concave up and state the point(s) of inflection.

**4. An equation of the line tangent to $y = x^3 + 3x^2 + 2$ at its point of inflection is ____.

4. State any x -values of any relative minimum(s) for $f(x) = \frac{x^2 + 1}{x^2 - 4}$.

Justify your answer(s).

5. For $f(x) = x^3 + x^2 - 5x - 5$, find the intervals where f is concave up. Justify.