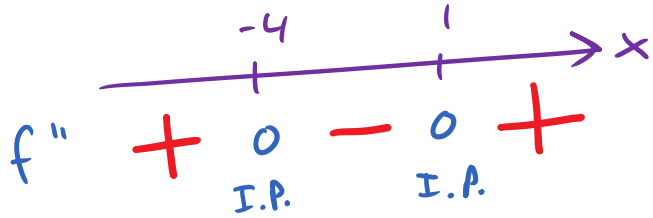
1. Determine the intervals of concavity for $f(x) = x^4 + 6x^3 - 24x^2 + 2$, and find all inflection points.

$f'(x) = 4x^3 + 18x^2 - 48x$

$f''(x) = 12x^2 + 36x - 48$

$= 12(x^2 + 3x - 4)$

$= 12(x+4)(x-1)$



$f''(x) = 0$:

$12(x+4)(x-1) = 0$

$x = -4$ $x = 1$

Concave up: $x < -4$, $x > 1$

Concave down: $-4 < x < 1$

$f''(x)$ DNE:

Nowhere

Inflection points:

$(-4, -510)$, $(1, -15)$

2. Use the 2nd Derivative Test to find the relative maxima and minima of $f(x) = 2x + 1 + \frac{2}{x}$.

$f'(x) = 2 - \frac{2}{x^2}$

$f''(x) = \frac{4}{x^3}$

$f'(x) = 0$:

$2 - \frac{2}{x^2} = 0$

$2 = \frac{2}{x^2}$

$2x^2 = 2$

$x^2 = 1$

$x = \pm 1$

$(-1, -3)$ $(1, 5)$

↑ $f(-1)$ ↑ $f(1)$

2nd Derivative Test:

$f''(-1) = \frac{4}{(-1)^3} = -4 < 0$

So, $(-1, -3)$ is a relative max

$f''(1) = \frac{4}{(1)^3} = 4 > 0$

So, $(1, 5)$ is a relative min

Q: What holds water yet is full of holes?