

**MATH 155A FALL 13
EXAMPLES SECTION 3.3.**

Question. Find the intervals where f is concave up and down. $f(x) = 2x^4 + 4x^3 - 72x^2 + 24x + 24$.

Solution.

Compute

$$f'(x) = 8x^3 + 12x^2 - 144x + 24,$$

and

$$f''(x) = 24x^2 + 24x - 144 = 24(x^2 + x - 6),$$

or

$$f''(x) = 24(x - 2)(x + 3).$$

Setting $f''(x) > 0$ we have

$$x - 2 > 0 \text{ and } x + 3 > 0,$$

or

$$x - 2 < 0 \text{ and } x + 3 < 0,$$

so that $x > 2$ or $x < -3$.

Analogously, setting $f''(x) < 0$ we have

$$x - 2 < 0 \text{ and } x + 3 > 0,$$

or

$$x - 2 > 0 \text{ and } x + 3 < 0,$$

so that $-3 < x < 2$. Hence f is concave up on $(-\infty, -3) \cup (2, \infty)$ and concave down on $(-3, 2)$.

URL: <http://www.disconzi.net/Teaching/MAT155A-Fall-13/MAT155A-Fall-13.html>