

**EXAMPLE 2** A deceptive polynomial Use the graphing guidelines to graph

$$f(x) = \frac{x^3}{3} - 400x \text{ on its domain.}$$

1) Domain  $(-\infty, \infty)$

2) Symmetry?

$f(x) \rightarrow x^3, x^1$  Odd F.  
sym. due to the origin

3) Critical P.

$$f'(x) = \frac{3x^2}{3} - 400 = x^2 - 400$$

First-order crit. P:  $f'(x) = 0$  or ~~DNE~~  
 $x^2 - 400 = 0$   
 $x = \pm 20$

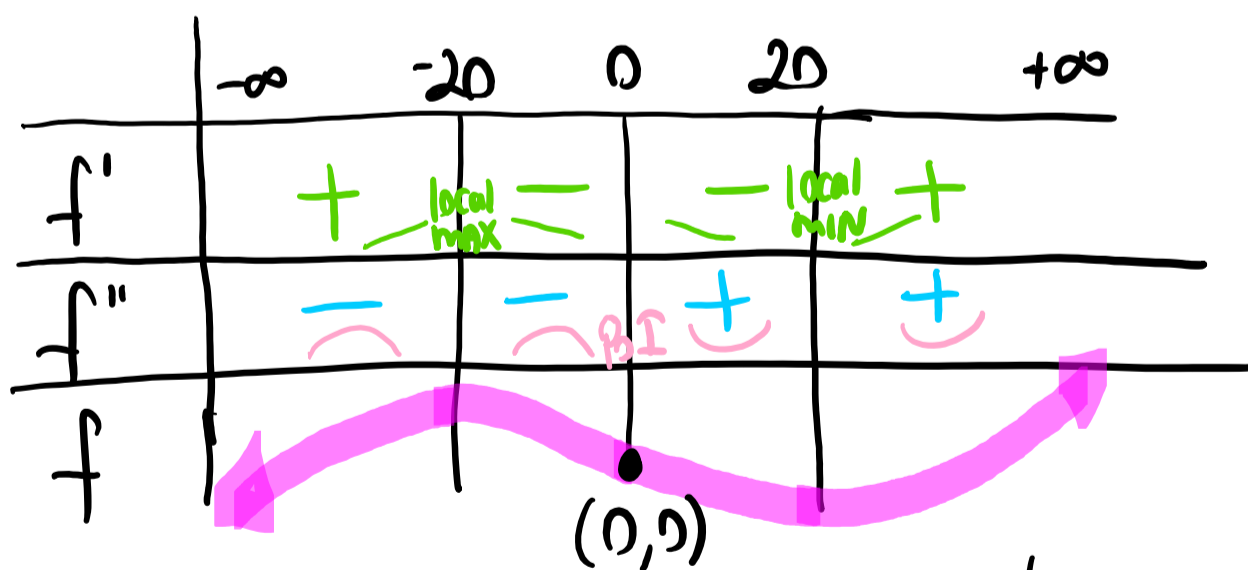
$$f''(x) = 2x$$

Second-order crit. P:  $f''(x) = 0$  or ~~DNE~~  
 $2x = 0 \Rightarrow x = 0$   
candidate for P, I

$$f'(x) = x^2 - 400$$

$$f''(x) = 2x$$

4) Sign chart for  $f', f''$



$$x \rightarrow \pm \sqrt{400}$$

5) Intercepts:

$$f(x) = \frac{x^3}{3} - 400x$$

$$x = 0$$

$$y \rightarrow \text{int.} \rightarrow y = 0$$

$$(0, 0)$$

$$y = 0 \quad x \rightarrow \text{int.}$$

$$f(x) = y = 0 = \frac{x^3}{3} - 400x$$

$$\frac{x^3}{3} - 400x = 0$$

$$x^2 = 1200$$

$$= x \left( \frac{x^2}{3} - 400 \right)$$

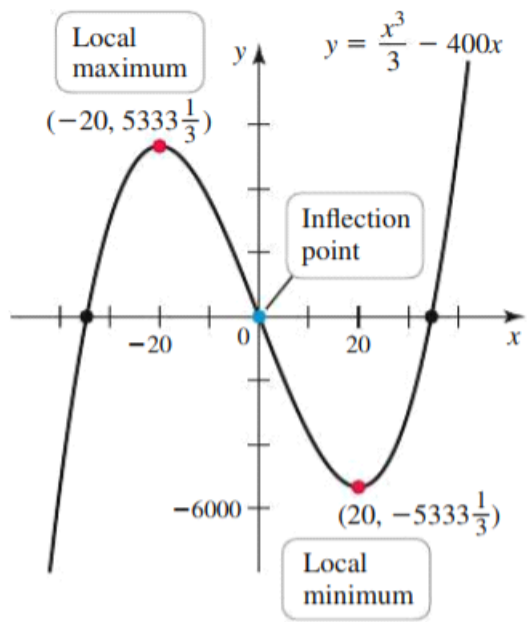


Figure 4.50

