

§4.4 - Graphing Functions (Part I)Graphing Functions "Guidelines"

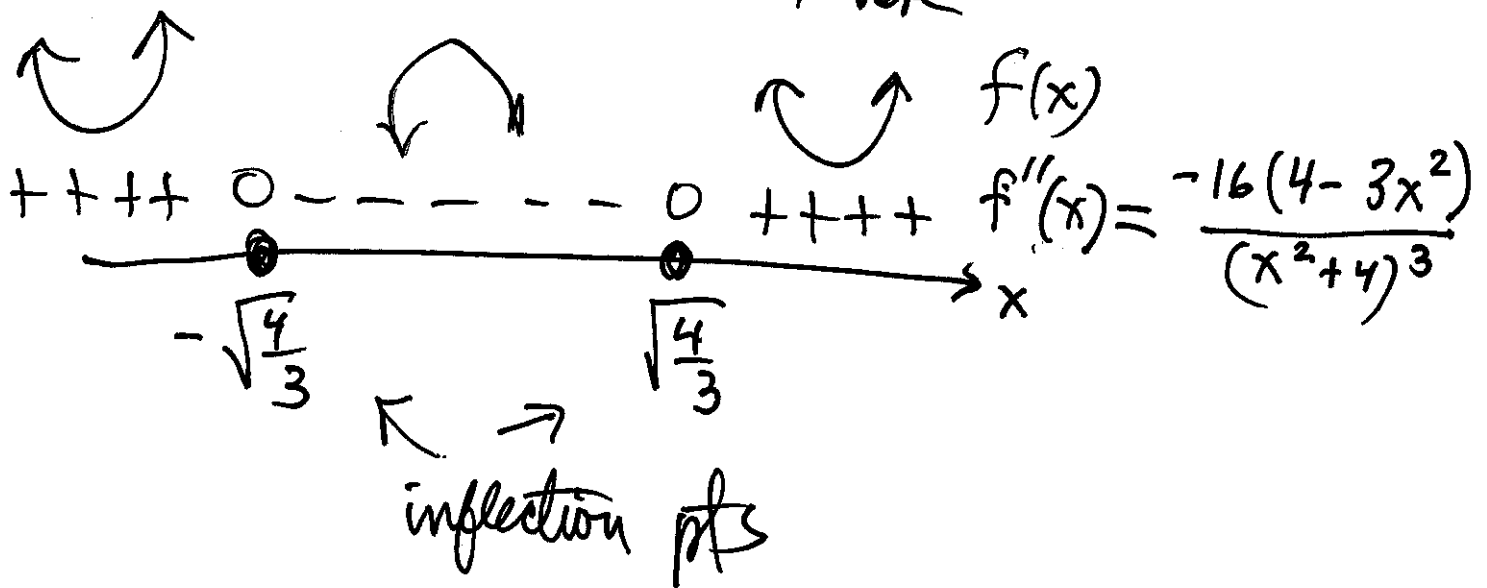
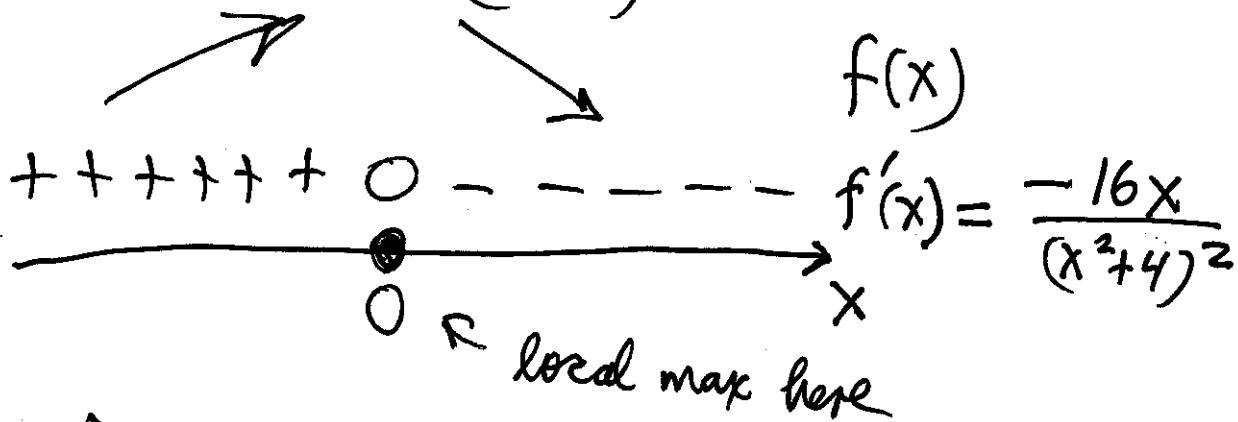
- 1 Determine domain/interval of interest
- 2 Use symmetry (if available)
- 3 Find intervals where $f \nearrow, \searrow$; local extrema
- 4 Find intervals where $f \curvearrowright, \curvearrowleft$; inflection pts
- 5 Locate asymptotes (Vertical/Horizontal/Slant)
- 6 Look for x, y intercepts

Ex 1 Sketch graphs of $y = f(x)$ (2)

(a) $y = f(x) = \frac{8}{x^2 + 4}$ Domain is all x

$\Rightarrow f'(x) = \frac{-16x}{(x^2 + 4)^2}$ ✓

$\Rightarrow f''(x) = \frac{-16(4 - 3x^2)}{(x^2 + 4)^3}$ ✓✓



x-intercept: $y = \frac{8}{x^2+4} = 0$
 (set $y=0$) No soln

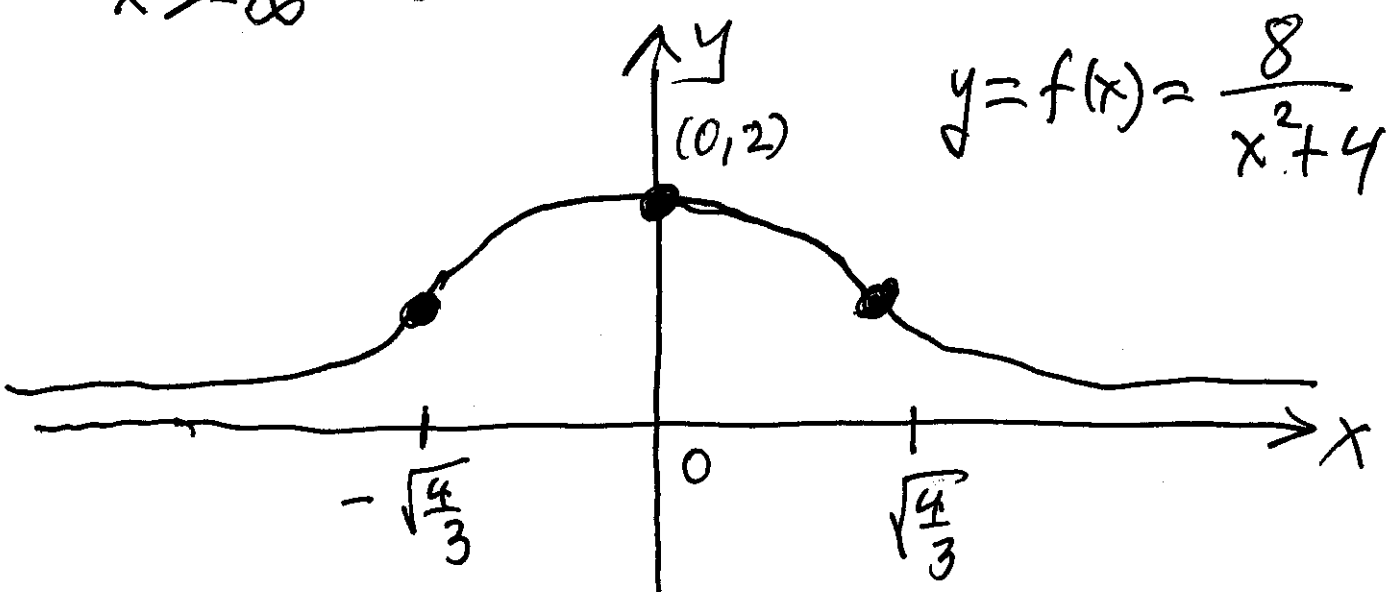
(3)

y-intercept: $y = \frac{8}{0^2+4} = 2$ $(0, 2)$ ✓
 (set $x=0$)

$y = f(x) = \frac{8}{x^2+4} \Rightarrow$ No vertical asymptotes!

$\lim_{x \rightarrow \infty} f(x) = 0 \Rightarrow y = 0$ horiz. asymptote.

$\lim_{x \rightarrow -\infty} f(x) = 0$



Witch of Agnesi Curve

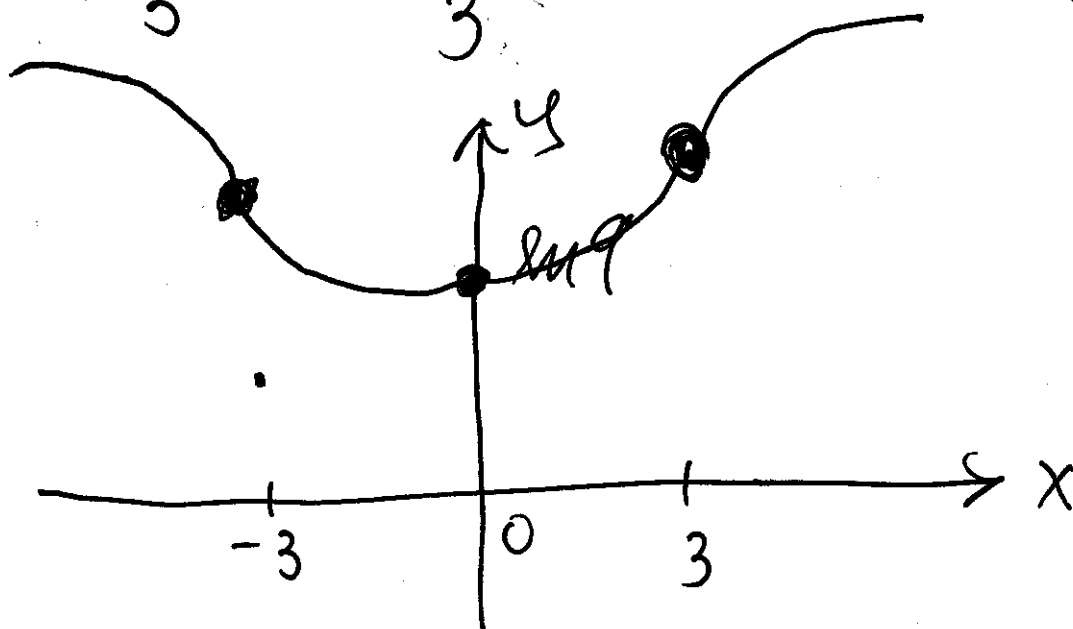
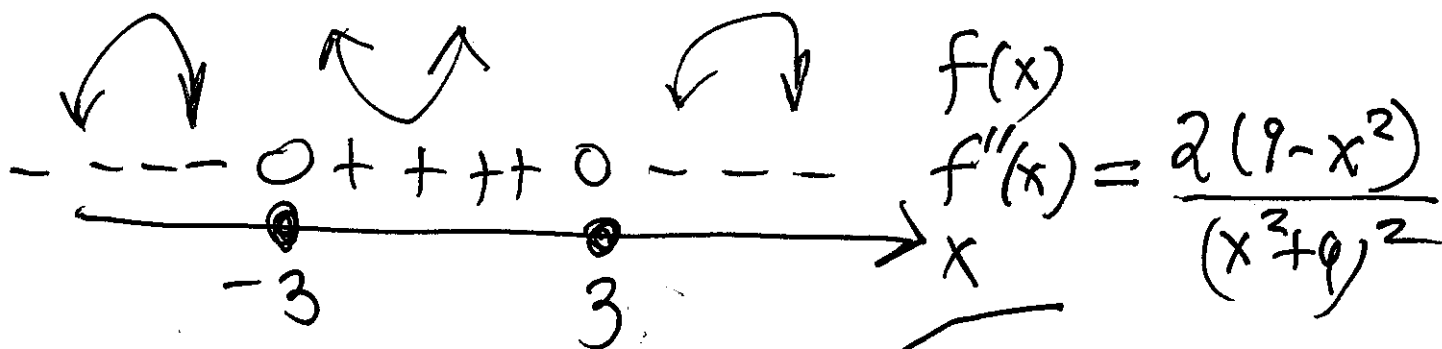
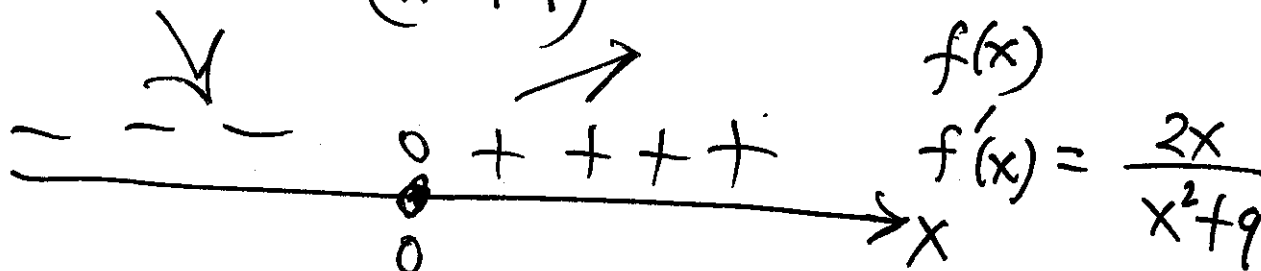
Note: $f(-x) = f(x) \Rightarrow$ curve symm.
 w.r.t. y-axis

⑥ $y = f(x) = \ln(x^2 + 9)$

Domain is all x ④

$f'(x) = \frac{2x}{x^2 + 9}$ ✓

$f''(x) = \frac{2(9 - x^2)}{(x^2 + 9)^2}$ ✓✓



⑤ $y = f(x) = 3\sqrt{x} - x\sqrt{x}$

$x \geq 0$ ⑤

$f'(x) = \frac{3}{2} x^{-1/2} (1-x)$ ✓

$f''(x) = \frac{3}{4} x^{-3/2} (-1-x)$ ✓✓

