

1. Find asymptotes of  $f(x) = \frac{x^2+4}{x+1}$  and sketch the graph, labeling critical points, local max and min and inflection points.

$$\begin{array}{r} x-1 \\ x+1 \overline{) x^2+4} \\ \underline{x^2+x} \phantom{0} \\ -x+4 \\ \underline{-x-1} \\ 5 \end{array}$$

$$\Leftrightarrow f(x) = x-1 + \frac{5}{x+1}$$

$$f' = 1 + 5 \frac{-1}{(x+1)^2}$$

$$f'' = 10 \frac{1}{(x+1)^3}$$

$$f'' \begin{cases} > 0 & \text{on } x \in (-1, \infty) \\ < 0 & \text{on } x \in (-\infty, -1) \end{cases}$$

$$f' = \frac{x^2+2x-4}{(x+1)^2} \rightarrow f' = 0 \rightarrow x = -1 \pm \sqrt{5}$$

$$f' \begin{cases} < 0 & \text{on } x \in (-1-\sqrt{5}, -1+\sqrt{5}) \\ > 0 & \text{on } x \in (-\infty, -1-\sqrt{5}) \cup (-1+\sqrt{5}, \infty) \end{cases}$$

