

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

a) Find domain, extrema, c.p. & infl. pts

Domain is $x \neq 1$

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

$f'(x)$ DNE at $x=1$, but this isn't in domain of $f(x)$

$$f'(x) = 0 \text{ at } x = -1, 3$$

$$f(-1) = 0, f(3) = 8 \Rightarrow \text{c.p. } (-1, 0), (3, 8)$$

$$\begin{array}{c} f' \quad + \quad 0 \quad - \quad \text{DNE} \quad - \quad 0 \quad + \\ x \quad -1 \quad \quad 1 \quad \quad 3 \end{array}$$

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

Local max $(-1, 0)$
Local min $(3, 8)$

$$\text{-OR-}$$
$$\lim_{x \rightarrow 1^+} f(x) = \infty, \lim_{x \rightarrow 1^-} f(x) = -\infty$$

$$f''(x) = \frac{8}{(x-1)^3}$$

$f''(x)$ DNE at $x=1$, but this isn't in domain of $f(x)$

$f''(x) = 0$ doesn't happen

No infl. pts

b) Find VA, HA & SA

No HA

$$\lim_{x \rightarrow 1^+} f(x) = \infty, \lim_{x \rightarrow 1^-} f(x) = -\infty \Rightarrow \text{VA } x=1$$

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

$$x-1 \overline{) \begin{array}{r} x+3 \\ x^2+2x+1 \\ -x^2+x \\ \hline 3x+1 \\ -3x+3 \\ \hline 4 \end{array}} \quad R 4$$

$$\boxed{SA \ y = x + 3}$$

c) Find incr., decr., concave \uparrow & concave \downarrow intervals

$$f' \quad \begin{array}{c} + \quad 0 \quad - \quad \text{DNE} \quad - \quad 0 \quad + \\ \hline x \quad -1 \quad 1 \quad 3 \end{array}$$

$$\boxed{\begin{array}{l} \text{Incr. on } (-\infty, -1) \cup (3, \infty) \\ \text{Decr. on } (-1, 1) \cup (1, 3) \end{array}}$$

$$f'' \quad \begin{array}{c} - \quad \text{DNE} \quad + \\ \hline x \quad 1 \end{array}$$

$$\boxed{\begin{array}{l} \text{Concave } \uparrow \text{ on } (1, \infty) \\ \text{Concave } \downarrow \text{ on } (-\infty, -1) \end{array}}$$

d) Graph

