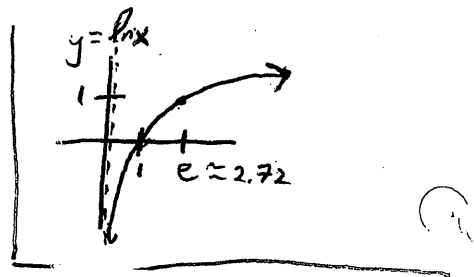


Ch. 5.1

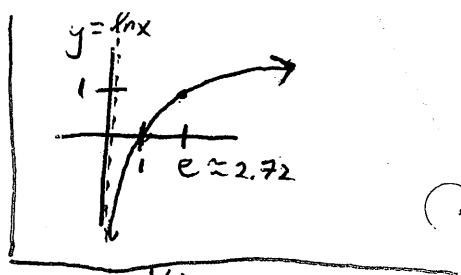
83) Find relative extrema, points of inflection, and Domain. Sketch graph.

$$y = \frac{x}{\ln x}$$



83) Find relative extrema, points of inflection

$$y = \frac{x}{\ln x} \quad \text{Domain: } (0, 1) \cup (1, \infty)$$



$$y' = \frac{(1) \ln x - x \left(\frac{1}{x}\right)}{(\ln x)^2} = \frac{\ln x - 1}{(\ln x)^2}$$

$$\ln x - 1 = 0$$

$$\ln x = 1$$

$$e^1 = x$$

↓	↓	↑
0	1	e

Rel. min at $x = e$
 $y(e) = e$ point: (e, e)

$$y'' = \frac{\left(\frac{1}{x}\right)(\ln x)^2 - (\ln x - 1) \cdot 2(\ln x) \left(\frac{1}{x}\right)}{(\ln x)^2}$$

$$y''(x) = \frac{\frac{1}{x} \ln x [\ln x - 2(\ln x - 1)]}{(\ln x)^2} = \frac{\ln x - 2 \ln x + 2}{x \ln x}$$

$$y'' = \frac{-\ln x + 2}{x \ln x} \quad | \quad -\ln x + 2 = 0$$

$$\ln x = 2$$

$$e^2 = x$$

∩	∪	∩
0	1	e^2

POI at $x = e^2$

$$y(e^2) = \frac{e^2}{2}$$

POI at point $(e^2, \frac{e^2}{2})$

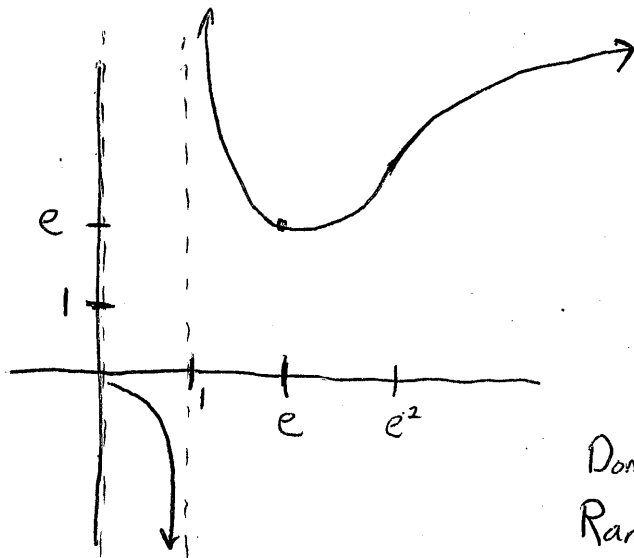
V.A. at $x = 1, x = 0$

$$* \lim_{x \rightarrow 0^-} \frac{x}{\ln x} = 0$$

$$\lim_{x \rightarrow 1^-} \frac{x}{\ln x} = \frac{+}{-} = -\infty$$

$$\lim_{x \rightarrow 1^+} \frac{x}{\ln x} = \frac{+}{+} = +\infty$$

$$\lim_{x \rightarrow \infty} \frac{x}{\ln x} = +\infty$$



Domain: $(0, 1) \cup (1, \infty)$
 Range: $(-\infty, 0) \cup [e, \infty)$

↑
 comparative growth rate: Logs < Radicals < Algebraic/Polynomials < exponentials