9. Use the guidelines of this section to sketch the curve.

$$y = \frac{x}{x-1}$$

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

Intercepts:

y-int.: $f(0) = 0$

x-int.: $0 = \frac{x}{x-1} = 0$

Symmetry:

Even?

$f(x) = f(-x)$?

$f(2) = 2 \neq f(-2) = .67$

Odd?

$-f(x) = f(-x)$?

$-f(2) = -2 \neq .67$

Asymptotes:

va: $x = 1$

$$\lim_{x \to 1^-} \frac{x}{x-1} = -\infty$$

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

$$\lim_{x \to \infty} \frac{x}{x-1} = 1$$

$$\lim_{x \to -\infty} \frac{x}{x-1} = 1$$

Decreasing/Increasing Intervals:

$$f(x) = y = \frac{x}{x-1}$$

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

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

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

$$f'(0) = -1$$

	f'	f
$x>1$	$-$	$\searrow$
$x<1$	$-$	$\searrow$

Local Min./Max.:
We see above that the function is decreasing on its entire domain. So, there is no local min./max. value.

Concavity:

$$f'(x) = -(x-1)^{-2}$$

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

	f''	f
$x<1$	$-$	$\frown$
$x>1$	$+$	$\smile$

Inflection Points:
Above, we can see that an inflection point exists at $\big(1, f(1)\big) = (1, \text{undefined}) = \text{no inflection point}$

Graph: