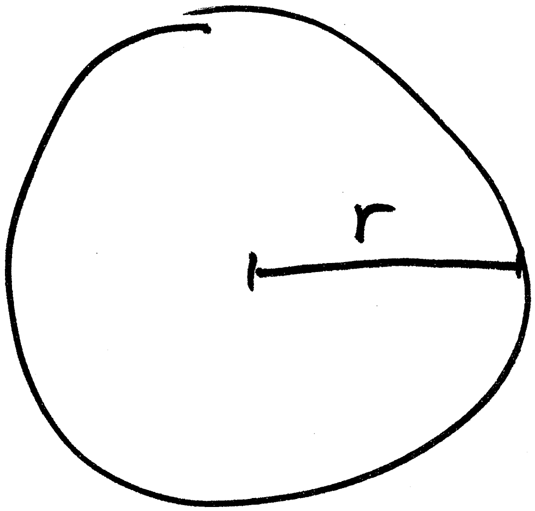
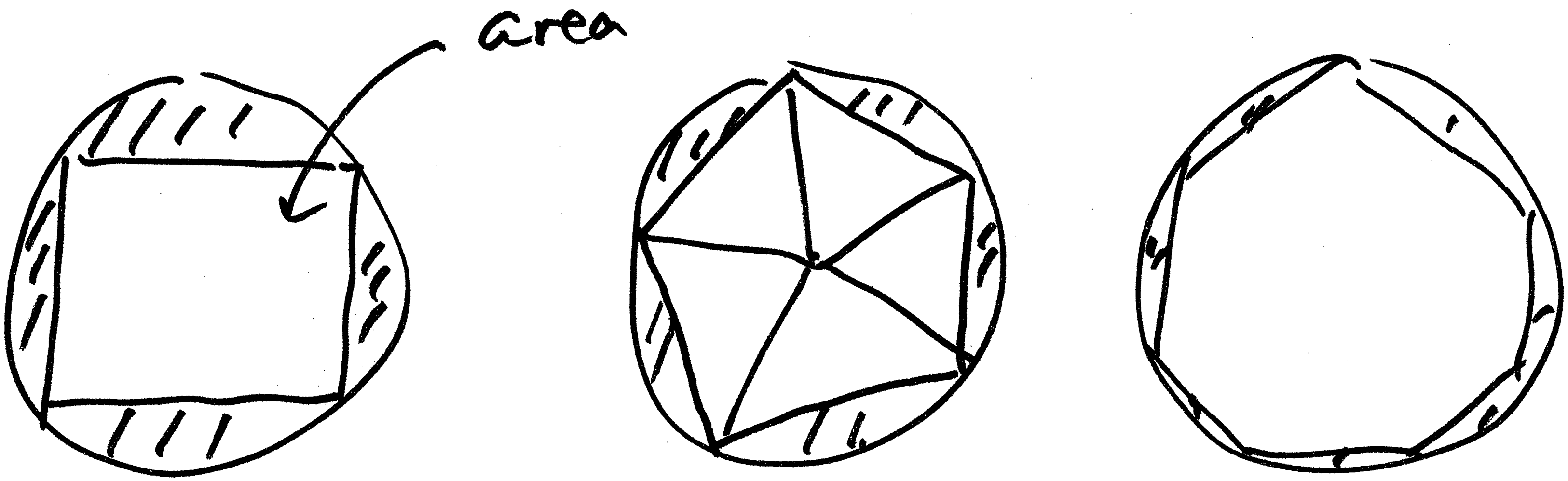


$\cancel{A = \pi r^2}$

How to calculate the area of circle with just a ruler and a compass



<u>Limits</u>

area unaccounted for gets smaller
eventually polygon area $\approx$ area of circle

$f(x) = \frac{1}{x^2}$ domain: $(-\infty, 0) \cup (0, \infty)$

$f(0)$ is undefined

what happens to $f(x)$ as x approaches 0?

approach 0 $\longrightarrow$ $\longleftarrow$ approach 0

x	-0.1	-0.01	-0.001	0	0.001	0.01	0.1
$f(x)$	100	10,000	1,000,000	X	1,000,000	10,000	100

unbounded

approach ∞

the limit of the function $f(x) = \frac{1}{x^2}$ as x approaches 0 is ∞

$$\boxed{\lim_{x \to 0} \frac{1}{x^2} = \infty}$$

in general, $\lim_{x \to a} f(x) = L$

as we make X arbitrarily close to a (without getting to a), we make $f(x)$ <u>arbitrarily close to L</u>.

if $L \neq \pm\infty$

$f(x) = \frac{1}{X}$ $\qquad$ $\lim_{x \to 0} f(x) = ?$

x	-0.1	-0.01	-0.001	0	0.001	0.01	0.1
$f(x)$	-10	-100	-1000	X	1000	100	10

approach large negative number $\qquad$ approach lage positive number

no common goal in sight

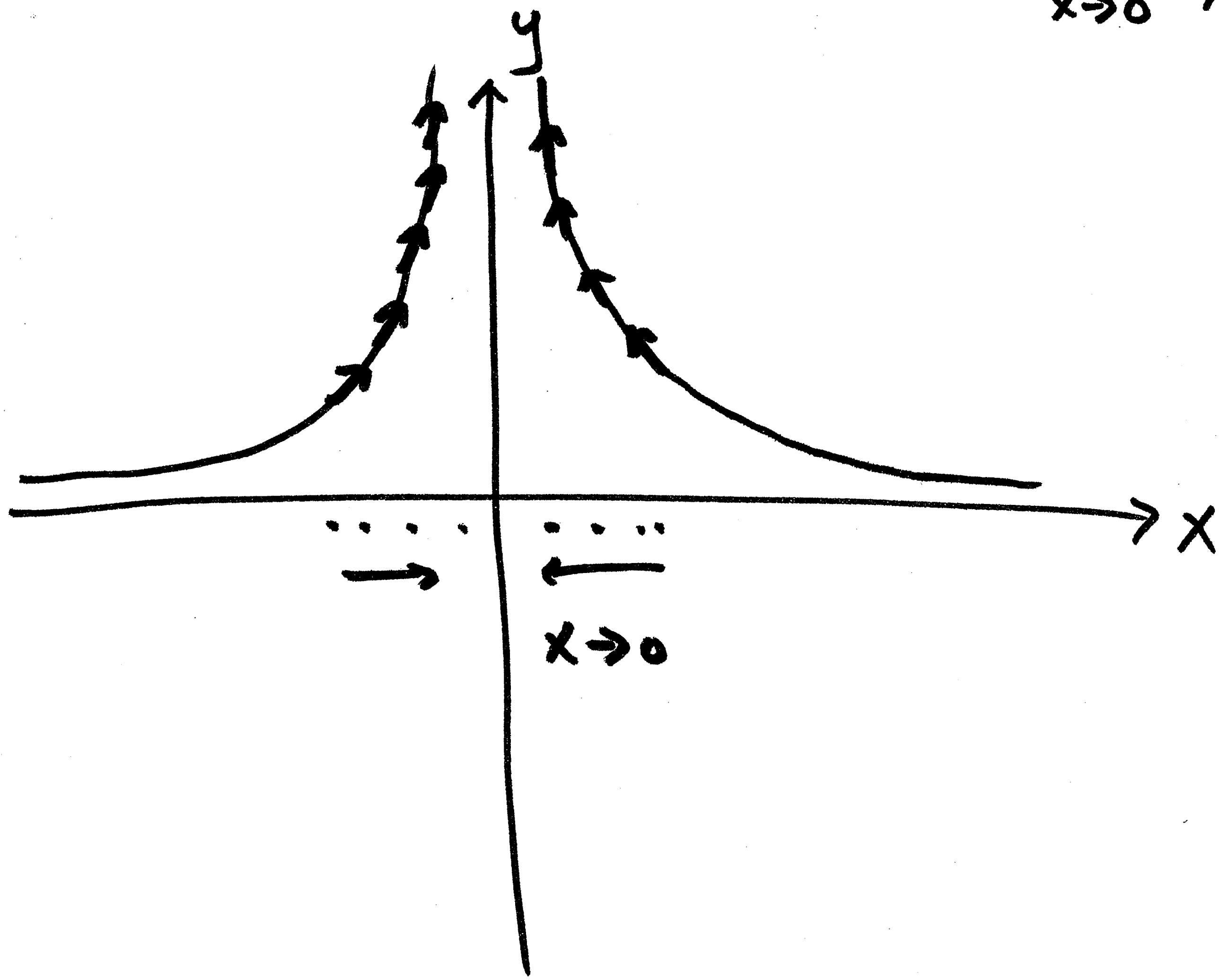
limit does not exist

$$\boxed{\lim_{x \to 0} \frac{1}{X} \quad \text{DNE}}$$

NOTE: NOT $\lim_{x \to 0} \frac{1}{X} = \text{DNE}$

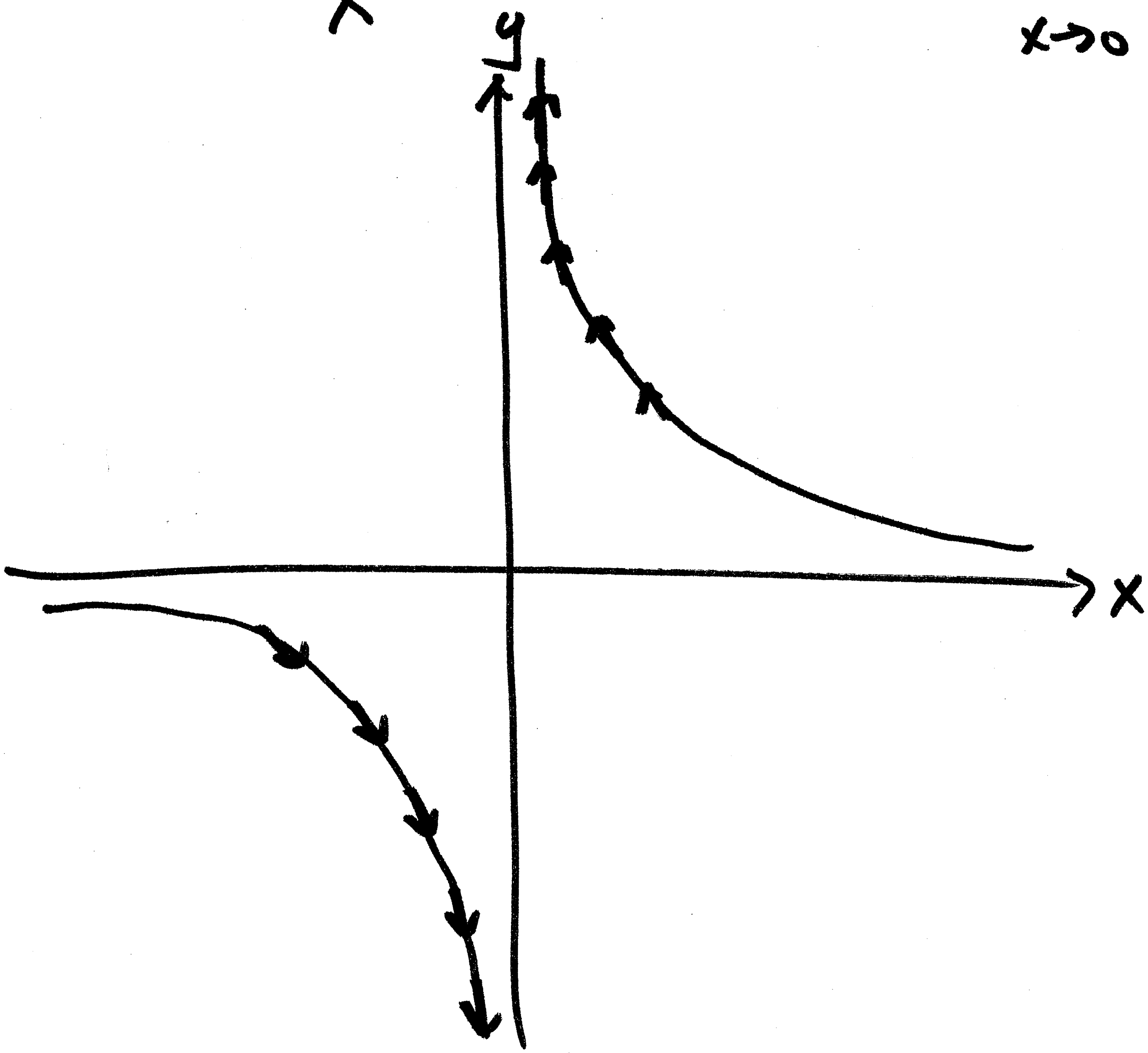
$f(x) = \frac{1}{x^2}$

$\lim_{x \to 0} \frac{1}{x^2} = \infty$

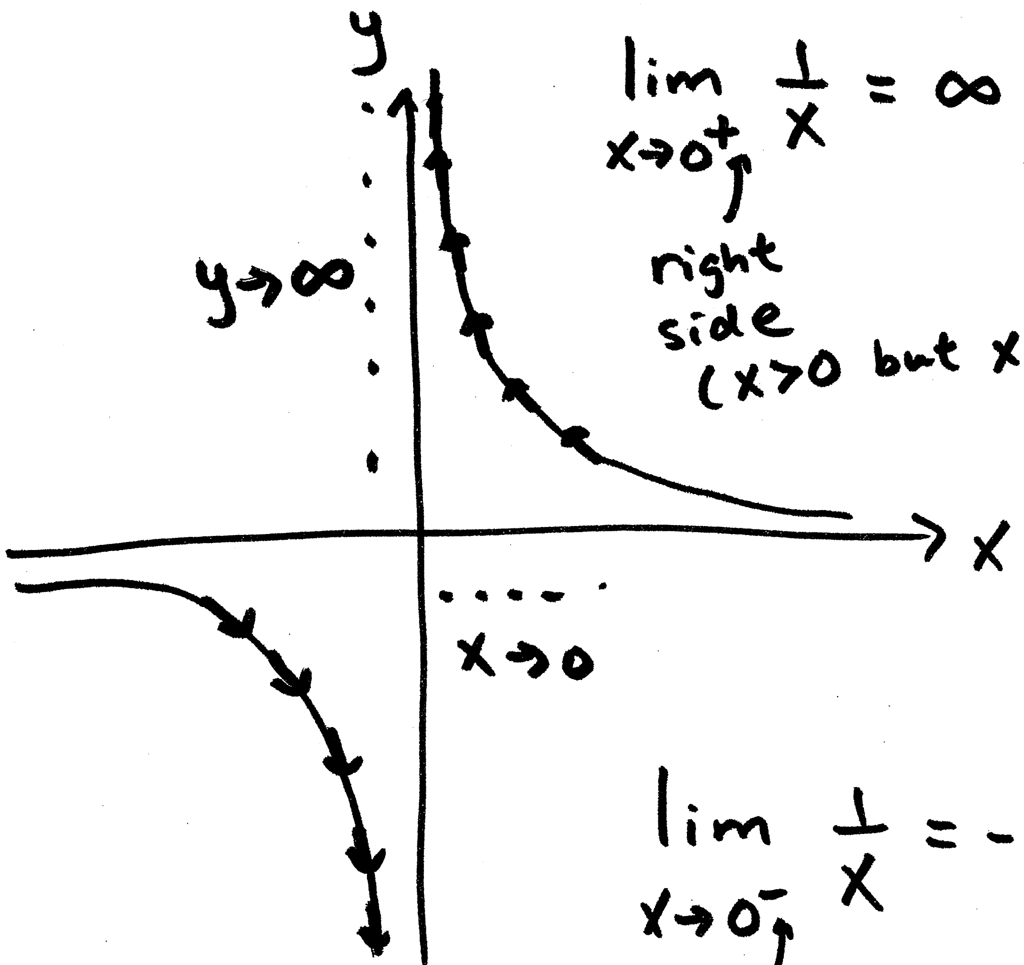


$f(x) = \frac{1}{x}$

$\lim\limits_{x \to 0} \frac{1}{x}$ DNE



$f(x) = \frac{1}{x}$ but only pay attention to one side of $x=0$ one at a time



$$\lim_{x \to 0^+} \frac{1}{x} = \infty$$

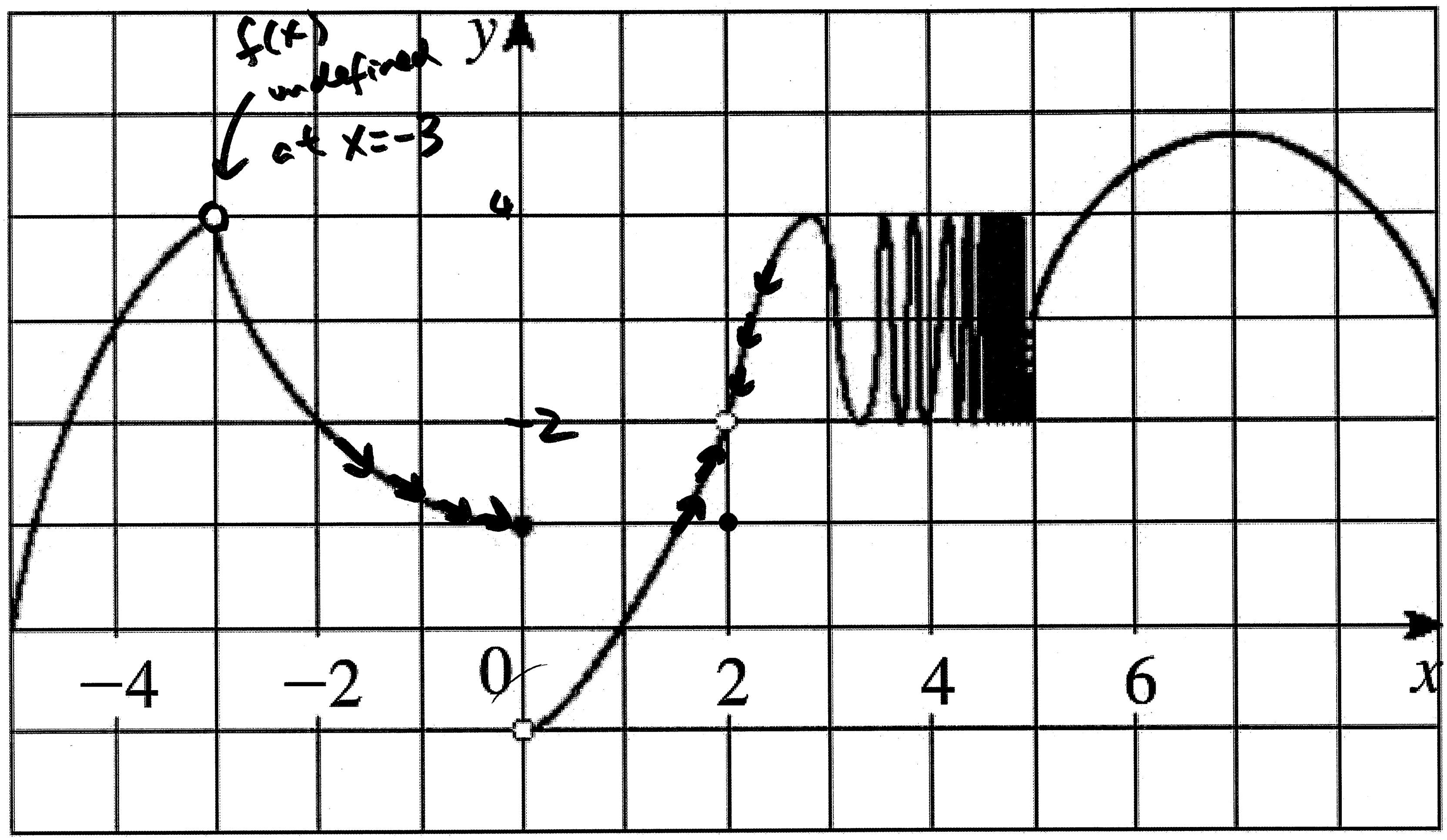
right side
($x > 0$ but $x \to 0$)

one-sided limit

BUT $\lim_{x \to 0} \frac{1}{x}$ DNE

$$\lim_{x \to 0^-} \frac{1}{x} = -\infty$$

left side
($x < 0$ but $x \to 0$)



Find: $\lim_{x \to -3} f(x) = 4$, $\lim_{x \to 0} f(x)$ DNE , $\lim_{x \to 2} f(x) = 2$, $f(2) = 1$

$\lim_{x \to 0^+} f(x) = -1$

$\lim_{x \to 0^-} f(x) = 1$

x close to 2, BUT NOT equal to 2

$$\lim_{x \to -9^-} \frac{x+10}{x+9} \qquad 0 \qquad \infty \qquad \text{DNE} \qquad \boxed{-\infty}$$

as $x \to -9^-$ ($x < -9$ & but close to -9)

so $x + 10 > 0$

so $x + 9 < 0$ but very small #

$$\frac{13}{0.0000001} \qquad \frac{\text{pos. \#}}{\text{very small neg. \#}} = -\infty$$

x	-9.1	-9.01	$\ldots$
$f(x)$			