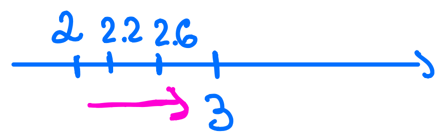
$\boxed{\text{Solutions}}$

# WORKSHEET: SECTION 2.2 DAY TWO

1. Determine the infinite limit. Explain your reasoning.

(a) $\lim\limits_{x\to 3^-} \dfrac{\sqrt{x}}{x-3} = \dfrac{\sqrt{3}}{0^-} = -\infty$




$2-3=-1$

$2.2-3=-0.8$

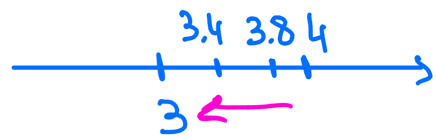
$2.6-3=-0.4$

....

$2.999-3=-0.001$

....

(b) $\lim\limits_{x\to 3^+} \dfrac{\sqrt{x}}{x-3} = \dfrac{\sqrt{3}}{0^+} = +\infty$




$4-3=1$

$3.8-3=0.8$

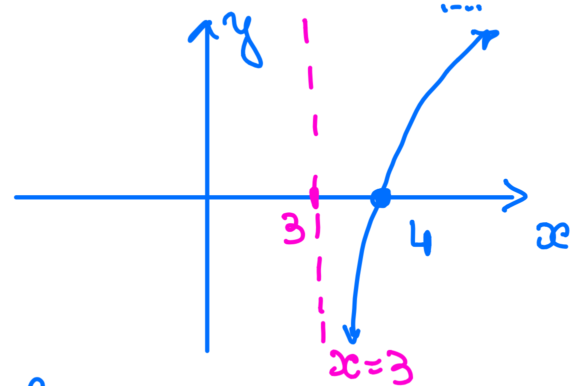
....

$3.001-3=0.001$

....

(c) $\lim\limits_{x\to 3^+} \dfrac{2-10x}{x-3} = \dfrac{-28}{0^+} = -\infty$

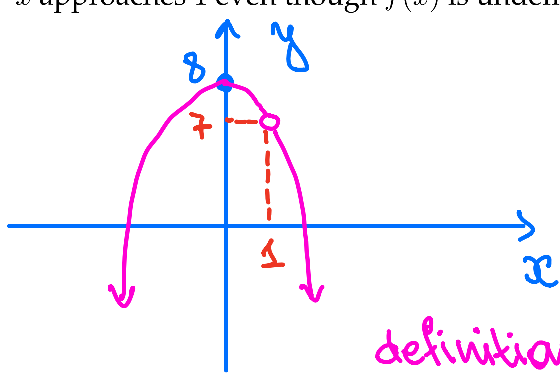
(d) $\lim\limits_{x\to 3^+} \ln(x-3) = -\infty$




(e) Why didn't we ask you to find $\lim\limits_{x\to 3^-} \ln(x-3)$?

$y=\ln(x-3)$ is not defined for $x \le 3$.
The $\mathrm{Dom}(\ln(x-3)) = (3,\infty)$.

2. Let $f(x) = 8 - x^2$ have domain $(-\infty, 1) \cup (1, \infty)$. Sketch $f(x)$ and explain why $f(x)$ has a limit as $x$ approaches 1 even though $f(x)$ is undefined at $x = 1$.




$\lim\limits_{x\to 1} (8-x^2) = 7$

$f(1)$ DNE

The limit exists since for its definition the function $f(x)=8-x^2$ has to be defined near $x=1$, but not exactly at $x=1$.

3. Find the vertical asymptotes of the function $y = \dfrac{x^2+1}{3x-2x^2}$.

$y = \dfrac{x^2+1}{x(3-2x)}$

The denominator converts to 0 at $x=0$ or $3-2x=0$
$x=\frac{3}{2}$

Then

$\lim\limits_{x\to \boxed{0}} \dfrac{x^2+1}{x(3-2x)} = \boxed{\infty}$ and $\lim\limits_{x\to \boxed{3/2}} \dfrac{x^2+1}{x(3-2x)} = \boxed{\infty}$

Hence, vertical asymptotes are $x=0$, $x=3/2$.