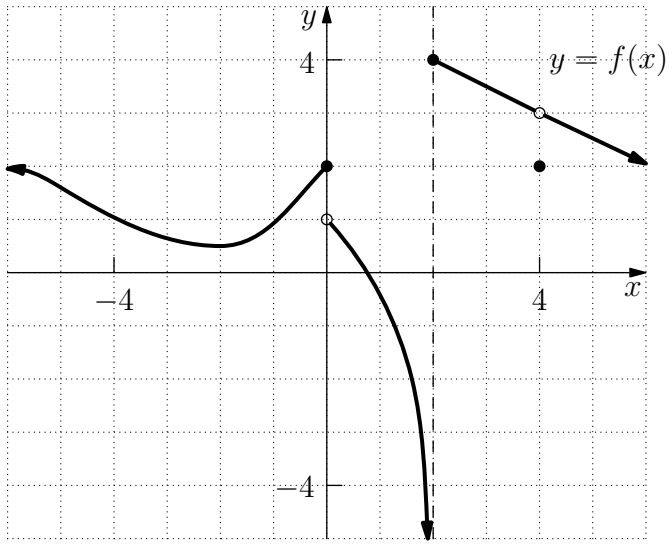
MATH 114: Quiz #1 – SOLUTIONS

/5 **Problem 1:** The graph of $y = f(x)$ is shown below.



Evaluate:

(i) $\lim_{x\to 0^-} f(x) \quad = 2$

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

(iii) $\lim_{x\to 0} f(x)$ does not exist

(iv) $\lim_{x\to 4} f(x) \quad = 3$

(v) $f(4) \quad = 2$

/3 **Problem 2:** Evaluate $\lim_{x\to 0} \dfrac{\sqrt{9+x}-3}{x}$.

$$\begin{aligned}
\lim_{x\to 0} \frac{\sqrt{9+x}-3}{x} &= \lim_{x\to 0} \frac{\sqrt{9+x}-3}{x} \cdot \frac{\sqrt{9+x}+3}{\sqrt{9+x}+3} \\
&= \lim_{x\to 0} \frac{(9+x)-9}{x(\sqrt{9+x}+3)} \\
&= \lim_{x\to 0} \frac{x}{x(\sqrt{9+x}+3)} \\
&= \lim_{x\to 0} \frac{1}{\sqrt{9+x}+3} \\
&= \frac{\lim_{x\to 0} 1}{\lim_{x\to 0} \sqrt{9+x} + \lim_{x\to 0} 3} \\
&= \frac{1}{\sqrt{\lim_{x\to 0} 9 + \lim_{x\to 0} x} + 3} \\
&= \frac{1}{\sqrt{9+0}+3} = \boxed{\frac{1}{6}}
\end{aligned}$$