

HW 3-29

$$\textcircled{1} \lim_{x \rightarrow 1} \frac{1 - 2\sqrt{x} + x}{2 - 3\sqrt{x} + x^2} = ?$$

$$\textcircled{2} \lim_{x \rightarrow 1} \frac{1 - 2\sqrt{x} + x}{3 - 3\sqrt{x} + \sqrt{x^3}} = ?$$

$\textcircled{3}$  If  $\varphi: \mathbb{R} \rightarrow \mathbb{R}$  is differentiable and  $\varphi'(x) = 0$  for all  $x \in \mathbb{R}$ , prove that  $\varphi$  is constant.

HW 3-31

$\textcircled{1}$  Does  $f_n(x) = \frac{x}{n}$  converge uniformly to 0 as  $n \rightarrow \infty$ ?  
Here  $x \in \mathbb{R}$ , so  $f_n: \mathbb{R} \rightarrow \mathbb{R}$ .

$\textcircled{2}$  Is it true? (a) If each  $g_k: \mathbb{R} \rightarrow \mathbb{R}$  is an increasing function, and  $g_k \rightarrow g$ , then  $g$  is also increasing.

(b) If each  $h_j: \mathbb{R} \rightarrow \mathbb{R}$  is bounded and  $h_j \rightarrow h$ , then  $h$  is bounded.

$\textcircled{3}$  Let  $g(x) = \begin{cases} 1 & \text{if } x \geq 0 \\ 0 & \text{if } x < 0 \end{cases}$ . Prove that there is no differentiable function  $h: \mathbb{R} \rightarrow \mathbb{R}$  such that  $h' = g$ .