$f(x) = \sqrt{x} = x^{\frac{1}{2}}$ $\quad f'(x) = \frac{d}{dx}\sqrt{x} = \frac{d}{dx} x^{\frac{1}{2}}$

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

$(\text{cond } f)(x) = \left| \frac{x f'(x)}{f(x)} \right|$ general case

$x \neq 0 \wedge y \neq 0$

$= \left| \frac{x^{\frac{1}{2}} \cdot x^{-\frac{1}{2}}}{x^{\frac{1}{2}}} \right|$

$= \frac{1}{2} \left| \frac{x^{\frac{1}{2}}}{x^{\frac{1}{2}}} \right|$

$= \frac{1}{2}$ $\quad \frac{1}{2} < 1$

$\therefore$ well conditioned

Note

$(\text{cond } f)(x) \geq 0$ $\quad$ i.e., $(\text{cond } f)(x) \in \mathbb{R}^+ \cup \{0\}$

Again... with a subtle trick!

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

$$\frac{f'(x)}{f(x)} = \frac{d}{dx} \ln(f(x))$$

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

$$\frac{d}{dx}\left(\frac{1}{2}\ln(x)\right)$$

$$= \frac{1}{2}\frac{d}{dx}\ln(x)$$

$$= \frac{1}{2x}$$

$$(\text{Cond } f)(x) = \left|\frac{x f'(x)}{f(x)}\right|$$

$$= \left|\frac{x}{2x}\right|$$

$$= \frac{1}{2}$$