$\sqrt{x} = \sqrt{x} \Rightarrow (\sqrt{x} - \sqrt{x})^2 = 0$

Set $\sqrt{x} = y$ then $(y - \sqrt{x})^2 = 0 \Rightarrow y^2 - 2\cdot\sqrt{x}\cdot y + x = 0$

$\Rightarrow \sqrt{x} = \frac{y^2 + x}{2y} \Rightarrow \sqrt{x} = \frac{(y + x/y)}{2}$

Consider now $\sqrt{x} = z \Rightarrow z = \frac{y + x/y}{2}$

Since $z = y = \sqrt{x}$ we want to approximate the square root with an appropriate amount of decimal points.

Let's say we want accuracy of $\underline{5}$ decimal points, then the difference $|y - z|$ should not exceed $10^{-5} = \underbrace{0.00001}_{\text{5 decimal points}}$.

To find the solution we iterate:

$y = z$

$z = (y + x/y)/2$

until $|y - z| >= 10^{-5}$ surpasses the desired accuracy.