HW Help for 5/1

Multiply the numerator *and* denominator by the conjugate of the expression containing the square root.

The *conjugate* of a two-term expression is just the same expression with subtraction switched to addition or vice versa.

For this problem, you multiply the top and the bottom by the conjugate of $\sqrt{x}-2$, which is $\sqrt{x}+2$.

$$\lim_{x\to 4}\frac{\sqrt{x}-2}{x-4}$$

$$=\lim_{x\to 4}\frac{\left(\sqrt{x}-2\right)}{\left(x-4\right)}\cdot\frac{\left(\sqrt{x}+2\right)}{\left(\sqrt{x}+2\right)}$$

The product of conjugates is always the square of the first thing minus the square of the second thing.

$$=\lim_{x\to 4}\frac{\sqrt{x}^2-2^2}{(x-4)(\sqrt{x}+2)}$$

$$=\lim_{x\to 4}\frac{x-4}{(x-4)(\sqrt{x}+2)}$$

Cancel the $(x-4)$ from the numerator and denominator.

$$=\lim_{x\to 4}\frac{1}{\sqrt{x}+2}$$

Now substitution works.

$$=\frac{1}{\sqrt{4}+2}$$

$$=\frac{1}{4}$$

So, $\lim_{x\to 4}\frac{\sqrt{x}-2}{x-4}=\frac{1}{4}$.