Question 1. Eliminate the radical from the numerator and simplify:

$$\frac{\sqrt{(x+h)-5}-\sqrt{x-5}}{h}$$

Question 2. Eliminate the radical from the numerator and simplify:

$$\frac{\frac{1}{\sqrt{x+h}}-\frac{1}{\sqrt{x}}}{h}$$

Solutions on the next page

Question 1. Eliminate the radical from the numerator and simplify:

$$\frac{\sqrt{(x+h)-5}-\sqrt{x-5}}{h}$$

conjugate of numerator: $\sqrt{x+h-5}+\sqrt{x-5}$

$$\frac{\sqrt{x+h-5}-\sqrt{x-5}}{h}\cdot\frac{(\sqrt{x+h-5}+\sqrt{x-5})}{(\sqrt{x+h-5}+\sqrt{x-5})}$$

* multiply top and bottom by conjugate

$$=\frac{(\sqrt{x+h-5})^2-\cancel{\sqrt{x-5}\sqrt{x+h-5}}+\cancel{\sqrt{x-5}\sqrt{x+h-5}}-(\sqrt{x-5})^2}{h(\sqrt{x+h-5}+\sqrt{x-5})}$$

* distribute the top, keep the bottom factored

$$=\frac{(\cancel{x}+h-\cancel{5})-(\cancel{x}-\cancel{5})}{h(\sqrt{x+h-5}+\sqrt{x-5})}$$

* simplify the top

$$=\frac{\cancel{h}}{\cancel{h}(\sqrt{x+h-5}+\sqrt{x-5})}$$

* simplify more

$$=\frac{1}{\sqrt{x+h-5}+\sqrt{x-5}}$$

Question 2. Eliminate the radical from the numerator and simplify:

$$\frac{\frac{1}{\sqrt{x+h}} - \frac{1}{\sqrt{x}}}{h}$$

Solution 1: Subtract fractions in numerator first

$$\frac{\frac{1}{\sqrt{x+h}} - \frac{1}{\sqrt{x}}}{h} = \frac{\frac{1}{\sqrt{x+h}}\cdot\frac{\sqrt{x}}{\sqrt{x}} - \frac{1}{\sqrt{x}}\cdot\frac{\sqrt{x+h}}{\sqrt{x+h}}}{h}$$

* getting common denominator

$$= \frac{\frac{\sqrt{x}-\sqrt{x+h}}{\sqrt{x}\cdot\sqrt{x+h}}}{h}$$

* combining fractions

$$= \frac{\sqrt{x}-\sqrt{x+h}}{\sqrt{x}\cdot\sqrt{x+h}}\cdot\frac{1}{h}$$

* rewrite division as multiplication

$$* \quad = \frac{\sqrt{x}-\sqrt{x+h}}{h\sqrt{x}\sqrt{x+h}}\;\frac{(\sqrt{x}+\sqrt{x+h})}{(\sqrt{x}+\sqrt{x+h})}$$

* multiply top and bottom by conjugate

$$= \frac{\sqrt{x}^2 + \cancel{\sqrt{x}\sqrt{x+h}} - \cancel{\sqrt{x}\sqrt{x+h}} - \sqrt{x+h}^2}{h\sqrt{x}\sqrt{x+h}(\sqrt{x}+\sqrt{x+h})}$$

$$= \frac{\cancel{x}-(\cancel{x}+h)}{h\sqrt{x}\sqrt{x+h}(\sqrt{x}+\sqrt{x+h})}$$

$$= \frac{-\cancel{h}}{\cancel{h}\sqrt{x}\sqrt{x+h}(\sqrt{x}+\sqrt{x+h})} = -\frac{1}{\sqrt{x}\sqrt{x+h}(\sqrt{x}+\sqrt{x+h})}$$

Solution 2: Multiply to eliminate complex fraction:

$$\frac{\left(\frac{1}{\sqrt{x+h}} - \frac{1}{\sqrt{x}}\right)}{h}\;\frac{\left(\frac{\sqrt{x}\sqrt{x+h}}{1}\right)}{\left(\frac{\sqrt{x}\cdot\sqrt{x+h}}{1}\right)} = \frac{\frac{\sqrt{x}\cancel{\sqrt{x+h}}}{\cancel{\sqrt{x+h}}} - \frac{\cancel{\sqrt{x}}\sqrt{x+h}}{\cancel{\sqrt{x}}}}{h\sqrt{x}\sqrt{x+h}}$$

$$= \frac{\sqrt{x}-\sqrt{x+h}}{h\sqrt{x}\sqrt{x+h}}$$

Now pick up at starred step above