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$$12. a) f(a) = \lim_{x \rightarrow a} \frac{\frac{1}{\sqrt{x}} - \frac{1}{\sqrt{a}}}{x-a}$$

$$= \lim_{x \rightarrow a} \frac{\left(\frac{\sqrt{a}}{\sqrt{a}}\right)\frac{1}{\sqrt{x}} - \frac{1}{\sqrt{a}}\left(\frac{\sqrt{x}}{\sqrt{x}}\right)}{x-a}$$

$$= \lim_{x \rightarrow a} \frac{\sqrt{a} - \sqrt{x}}{(x-a)(\sqrt{a}\sqrt{x})}$$

$$= \lim_{x \rightarrow a} \frac{(\sqrt{a} - \sqrt{x})(-1)}{(\sqrt{a} - \sqrt{x})(\sqrt{x} + \sqrt{a})(\sqrt{a}\sqrt{x})} \quad \begin{array}{l} \text{multiply top + bottom by } (\sqrt{a}\sqrt{x}) \\ (x-a) = (\sqrt{x}^2 - \sqrt{a}^2) \\ = (\sqrt{x} - \sqrt{a})(\sqrt{x} + \sqrt{a}) \end{array}$$

$$= \lim_{x \rightarrow a} \frac{-1}{(\sqrt{x} + \sqrt{a})(\sqrt{a}\sqrt{x})}$$

$$= \frac{-1}{(\sqrt{a} + \sqrt{a})(\sqrt{a}\sqrt{a})} \quad \text{plug } a \text{ in for } x$$

$$= \frac{-1}{a\sqrt{a} + a\sqrt{a}} = \frac{-1}{2a\sqrt{a}}$$

$$b) \frac{-1}{2a\sqrt{a}} = \frac{-1}{2(1)(\sqrt{1})} = -\frac{1}{2} \quad \text{Points } (1,1) \text{ and } (4, \frac{1}{2})$$

$$= \frac{-1}{2(4)(\sqrt{4})} = -\frac{1}{16}$$

$$y - y_1 = m(x - x_1) \quad \text{from } \frac{y - y_1}{x - x_1} = m$$

$$y - 1 = -\frac{1}{2}(x - 1)$$

and

$$y - \frac{1}{2} = -\frac{1}{16}(x - 4)$$