1. True. This is the definition of a removable discontinuity.
2. False, this limit evaluates to e.
3. (a) Plug in to the limit definition:

$$f'(3) = \lim_{h\to 0} \frac{f(3+h) - f(3)}{h} = \lim_{h\to 0} \frac{\frac{1}{(3+h)^2+1} - \frac{1}{3^2+1}}{h} = \lim_{h\to 0} \frac{\frac{1}{(3+h)^2+1} - \frac{1}{10}}{h}$$

Find a common denominator in the numerator.

$$= \lim_{h\to 0} \frac{\frac{10-(3+h)^2-1}{10(3+h)^2+10}}{h} = \lim_{h\to 0} \frac{\frac{-6h-h^2}{10(3+h)^2+10}}{h} = \lim_{h\to 0} \frac{-6-h}{10(3+h)^2+10} = \frac{-6}{100}$$

(b) Apply the chain rule with $f(x) = g(h(i(x)))$ where $g(x) = \ln(x), h(x) = \tan(x)$, and $i(x) = \frac{1}{x}$. $f'(x) = g'(h(i(x))) \cdot h'(i(x)) \cdot i'(x)$.

$$g'(x) = \frac{1}{x}, h'(x) = \sec^2(x), i'(x) = \frac{-1}{x^2}$$

$$f'(x) = \frac{1}{\tan(\frac{1}{x})} \cdot \sec^2(\frac{1}{x}) \cdot \frac{-1}{x^2}$$