1

1.1

$$\lim_{x \to \infty} f(x) = \lim_{x\ to\infty} \mathrm{Tan}^{-1}x + \lim_{x\ to\infty} \mathrm{Tan}^{-1}\frac{1}{x}$$
$$= \frac{\pi}{2} + 0 = \underline{\frac{\pi}{2}}$$

1.2

$x = \tan y$ の両辺を x で微分すると

$$1 = \frac{1}{\frac{1}{1+\tan^2 y}} \cdot \frac{\mathrm{d}y}{\mathrm{d}x}$$
$$\Leftrightarrow \frac{\mathrm{d}y}{\mathrm{d}x} = \frac{1}{1 + \tan^2 y} = \frac{1}{1 + x^2}$$

これより,

$$f'(x) = \frac{1}{1 + x^2} + \frac{1}{1 + \left(\frac{1}{x}\right)^2} \cdot -\left(\frac{1}{x}\right)^2$$
$$= \underline{0}$$