Example: #22 (p. 284).

$\lim_{x\to 0^+} \tan x \ln x$ is an indeterminate form of type $0\cdot\infty$.

We have two choices:

1) $\tan x \ln x = \dfrac{\tan x}{(\ln x)^{-1}}$ $\left(\frac{0}{0}\right)$

or 2) $\tan x \ln x = \dfrac{\ln x}{(\tan x)^{-1}}$ $\left(\frac{\infty}{\infty}\right)$

Either form can be used, but I believe it will be quicker to work with 2). Let's try it:

$$\lim_{x\to 0^+} \tan x \ln x = \lim_{x\to 0^+} \frac{\ln x}{(\tan x)^{-1}}$$

$$\underset{\left(l'H:\ \frac{\infty}{\infty}\right)}{=} \lim_{x\to 0^+} \frac{1/x}{-(\tan x)^{-2}\sec^2 x}$$

This equality is valid only because the new limit does exist.

$$= \lim_{x\to 0^+} -\frac{\tan^2 x}{x\sec^2 x}$$

$$= \lim_{x\to 0^+} -\frac{\frac{\sin^2 x}{\cos^2 x}}{x\,\frac{1}{\cos^2 x}}$$

$$= \lim_{x\to 0^+} -\frac{\sin^2 x}{x}$$

Note: This limit could be evaluated by l'H but it's not necessary

$$= \left(\lim_{x\to 0^+} -\sin x\right)\left(\lim_{x\to 0^+} \frac{\sin x}{x}\right)$$

$$= 0\cdot 1$$

$$= 0.$$