

$$31. \lim_{x \rightarrow 0} \frac{x + \sin x}{x + \cos x} = \frac{0}{1}$$
$$= 0$$

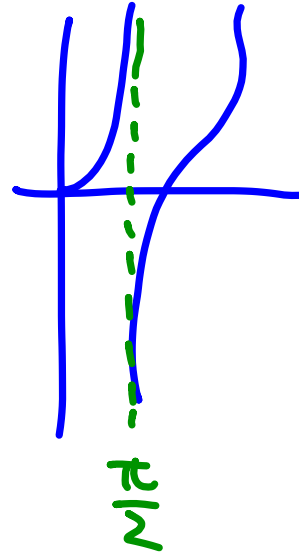
$$33. \lim_{x \rightarrow 1} \frac{1 - x + \ln x}{1 + \cos \pi x} = \lim_{x \rightarrow 1} \frac{-1 + \frac{1}{x} \sim x^{-1}}{-\sin(\pi x) \cdot \pi}$$

$$= \lim_{x \rightarrow 1} \frac{-\frac{1}{x^2}}{-\pi^2 \cos(\pi x)} = \frac{-1}{\pi^2}$$

$$45. \lim_{x \rightarrow 1^+} \ln x \tan(\pi x/2)$$

$$\textcircled{1} \frac{\tan(\pi x/2)}{(\ln x)'} = \frac{\tan(\pi x/2)}{-\frac{1}{(\ln x)^2} \cdot \frac{1}{x}}$$

$$\textcircled{2} \frac{\ln x}{\frac{1}{\tan(\pi x/2)}} = \frac{\ln x}{\cot(\pi x/2)}$$



$$\begin{aligned} \lim_{x \rightarrow 1^+} \frac{\ln x}{\cot(\pi x/2)} &= \lim_{x \rightarrow 1^+} \frac{\frac{1}{x}}{-\frac{\pi}{2} \csc^2(\pi x/2)} \\ &= \frac{1}{-\frac{\pi}{2}} = -\frac{2}{\pi} \end{aligned}$$

$$35. \lim_{x \rightarrow 1} \frac{x^a - ax + a - 1}{(x - 1)^2}$$

$$= \lim_{x \rightarrow 1} \frac{ax^{a-1} - a}{2(x-1)} = \lim_{x \rightarrow 1} \frac{a(a-1)x^{a-2}}{2}$$

$$= \frac{a(a-1)}{2}$$

$$41. \lim_{x \rightarrow 0} \cot 2x \sin 6x$$

$$= \lim_{x \rightarrow 0} \frac{\sin 6x}{\tan 2x} = \frac{6}{2}$$

$$39. \lim_{x \rightarrow \infty} x \sin(\pi/x)$$

$$\lim_{x \rightarrow 0} \frac{\sin ax}{bx} = \frac{a}{b}$$

$$\lim_{x \rightarrow \infty} \frac{\sin \frac{\pi}{x}}{\frac{1}{x}} = \lim_{x \rightarrow \infty} \frac{\sin \pi(\frac{1}{x})}{\frac{1}{x}}$$

$$= \lim_{\frac{1}{x} \rightarrow 0} \frac{\sin \pi(\frac{1}{x})}{\frac{1}{x}} = \pi$$