$$f(x) = \frac{1}{x}\frac{e^x}{(e^x-1)^2}$$
$$\times \left[\pi - \frac{2\tilde{r}/x}{(\tilde{r}/x)^2+1} - 2\tan^{-1}\left(\frac{\tilde{r}}{x}\right)\right]$$

$\tilde{r} = 2$