

average value  $e^x \cos(\pi e^x)$  on  $0 | \ln 2 = 0$

$$\text{average value } \frac{1}{b-a} \int_a^b f(x) dx$$

$$u = \pi e^x \Rightarrow du = \pi e^x dx \Rightarrow e^x dx = \frac{du}{\pi}$$

$$\frac{1}{\ln 2} \int_0^{\ln 2} e^x \cos(\pi e^x) dx = \frac{1}{\pi \ln 2} \int_{\pi}^{2\pi} \cos u \frac{du}{\pi} = \frac{1}{\pi^2 \ln 2} \sin u \Big|_{\pi}^{2\pi} = \frac{\sin(2\pi) - \sin \pi}{\pi^2 \ln 2} = 0$$