

$$\underline{3b} \quad S(h) = \int_0^{2\pi} e^{-x} \sin x \, dx = \frac{2\pi h^4}{180} f^{(4)}(z) < 10^{-4}$$

$$\frac{2\pi h^4}{180} f^{(4)}(z) = 10^{-4}$$

$$\frac{2\pi (\frac{\pi}{n})^4}{180} 4e^{-z} \sin(z) = 10^{-4}$$

$$\frac{128\pi^5}{180n^4} e^{-z} \sin(z) = 10^{-4}$$

$$= \sqrt[4]{\frac{128\pi^5}{180 \cdot 10^{-4}} e^{-z} \sin(z)}$$

$$\approx \sqrt[4]{2.1761 \times 10^6 \cdot e^{-z} \sin(z)}$$

$$z = \frac{3\pi}{2}$$

$$n \approx \sqrt[4]{2.1761 \times 10^6 \cdot 1.1132 \times 10^2}$$

$$n \approx 12476 \times 10^2$$

$$\rightarrow \hat{n} = 125$$