

解:

$$f(-x) = \sin(-x) + \frac{1}{\sin(-x)} = -\sin x - \frac{1}{\sin x} = -f(x)$$

故 ① 错误, ② 正确

$\sin x, \frac{1}{\sin x}$ 均关于 $x = \frac{\pi}{2}$ 对称, 则 ③ 正确

$$\text{法二: } f\left(\frac{\pi}{2} + x\right) = \sin\left(\frac{\pi}{2} + x\right) + \frac{1}{\sin\left(\frac{\pi}{2} + x\right)} = \cos x + \frac{1}{\cos x}$$

$$(f\left(\frac{\pi}{2} - x\right)) = \sin\left(\frac{\pi}{2} - x\right) + \frac{1}{\sin\left(\frac{\pi}{2} - x\right)} = \cos x + \frac{1}{\cos x}$$

显然 $f(x)$ 可以小于 0, 故 ④ 错误