1.

$$f'(x) = \left(rac{\sin x}{\cos x}
ight)' = rac{\cos^2 x + \sin^2 x}{\cos^2 x} = rac{1}{\cos^2 x}$$

所以切线为
$$y=rac{1}{\cos^2rac{\pi}{4}}ig(x-rac{\pi}{4}ig)+1=2x+1-rac{\pi}{2}$$

2.

$$g'(x) = 2(\cos(2x+1) + \tan x)$$

若
$$x \leq rac{\pi}{4} - rac{1}{2}$$
 则 $\cos(2x+1) \geq 0 \wedge \tan x > 0 \implies g'(x) > 0$

若
$$x>rac{\pi}{4}-rac{1}{2}$$
 则

由1且 f(x) 是凸函数可知 $an x \geq 2x + 1 - rac{\pi}{2}, \ orall x \in \left(0, rac{\pi}{2}
ight)$

则
$$g'(x) \geq 2\left(-\sin\left(2x+1-rac{\pi}{2}
ight)+2x+1-rac{\pi}{2}
ight)>0$$

所以
$$g'(x)>0,\ orall x\in \left(0,rac{\pi}{2}
ight)$$

$$\overline{\mathbb{m}}\;g(0)=\sin 1,\;\;igtiim x o rac{\pi}{2}\implies g(x) o +\infty$$

故
$$x \in \left(0, \frac{\pi}{2}\right)$$
 时 $g(x)$ 的值域为 $(\sin 1, +\infty)$