(iii) $(\sin x)^{\cos y} + (\cos x)^{\sin y} = a$

• ~~apply (log) in both sides.~~

$\Rightarrow \; e^{\cos y \log \sin x} + e^{\sin y \log \cos x} = a$

• Differentiate

$\Rightarrow \; \frac{d}{dx}[\cos y \log \sin x]\, e^{\cos y \log \sin x} + \frac{d}{dx}[\sin y \log \cos x]\, e^{\sin y \log \cos x} = 0$

$\Rightarrow \; \left[\cos y\left(\frac{d}{dx}\log \sin x\right) + \left(\frac{d}{dx}\cos y\right)\log \sin x\right] e^{\cos y \log \sin x} +$

$\left[\sin y\left(\frac{d}{dx}\log \cos x\right) + \left(\frac{d}{dx}\sin y\right)\log \cos x\right] e^{\sin y \log \cos x} = 0$

$\Rightarrow \left[\cos y\left(\frac{\cos x}{\sin x}\right) + \left(\frac{-\sin y}{\cos y}\right)\left(\frac{dy}{dx}\right)\log \sin x\right] (\sin x)^{\cos y} +$

$\left[\sin y\left(\frac{-\sin x}{\cos x}\right) + \left(\frac{\cos y}{\sin y}\right)\left(\frac{dy}{dx}\right)\log \cos x\right](\cos x)^{\sin y} = 0$

$\Rightarrow \left[\cos y(\cot x) - (\tan y)\left(\frac{dy}{dx}\right)\log \sin x\right](\sin x)^{\cos y} +$

$\left[\sin y(-\tan x) + \left(\frac{dy}{dx}\right)(\cot y)\log \cos x\right](\cos x)^{\sin y} = 0$