1. $y = x^{\sin x}$ $\quad \ln y = \ln x^{\sin x}$

$$\rightarrow \ln y = (\sin x)(\ln x)$$

$$\frac{1}{y}\frac{dy}{dx} = \sin x\left(\frac{1}{x}\right) + \ln x\,(\cos x)$$

$$\frac{dy}{dx} = y\left(\frac{\sin x}{x} + (\ln x)(\cos x)\right)$$

$$\boxed{\frac{dy}{dx} = x^{\sin x}\left[\frac{\sin x}{x} + \ln x \cos x\right]}$$

2. $y = (\cos x)^{\cos x}$ $\quad \ln y = \ln\left(\cos x^{\cos x}\right)$

$$\ln y = (\cos x)(\ln \cos x)$$

$$\frac{1}{y}\frac{dy}{dx} = \cos x\left[\frac{-\sin x}{\cos x}\right] + (-\sin x)(\ln \cos x)$$

$$\frac{dy}{dx} = y\left[-\sin x - \sin x \ln \cos x\right]$$

$$\boxed{\frac{dy}{dx} = (\cos x)^{\cos x}\left[-\sin x - \sin x \ln \cos x\right]}$$

3. $y = (\ln x)^x$ $\quad \ln y = \ln\left[(\ln x)^x\right]$

$$\ln y = x\left[\ln(\ln x)\right]$$

$$\frac{1}{y}\frac{dy}{dx} = x\left[\frac{\frac{1}{x}}{\ln x}\right] + \left[\ln(\ln x)\right](1)$$

$$\frac{dy}{dx} = y\left[\frac{1}{\ln x} + \ln(\ln x)\right] = \boxed{(\ln x)^x\left[\frac{1}{\ln x} + \ln(\ln x)\right]}$$

4. $y = (\tan x)^{(e^x)}$ $\quad \ln y = \ln\left((\tan x)^{e^x}\right)$

$$\ln y = e^x \ln \tan x$$

$$\frac{1}{y}\frac{dy}{dx} = e^x\left[\frac{\sec^2 x}{\tan x}\right] + e^x \ln \tan x$$

$$\frac{dy}{dx} = y\left(\frac{e^x}{\sin x \cos x} + e^x \ln \tan x\right)$$

$$\boxed{\frac{dy}{dx} = (\tan x)^{e^x}\left[\frac{e^x}{\sin x \cos x} + e^x \ln(\tan x)\right]}$$

5. $y = x^{(\sin^{-1} x)}$ $\quad \ln y = \ln x^{\sin^{-1} x}$

$$\ln y = (\sin^{-1} x)(\ln x)$$

$$\frac{1}{y}\frac{dy}{dx} = \frac{\sin^{-1} x}{x} + \frac{\ln x}{\sqrt{1-x^2}}$$

$$\frac{dy}{dx} = y\left[\frac{\sin^{-1} x}{x} + \frac{\ln x}{\sqrt{1-x^2}}\right] = \boxed{x^{\sin^{-1} x}\left[\frac{\sin^{-1} x}{x} + \frac{\ln x}{\sqrt{1-x^2}}\right]}$$