$$f'(x) = f(x) \cdot \left(\ln |f(x)| \right)'$$

a)

$$y = x^x = e^{\ln x^x} = e^{x \ln x}$$

$$y' = e^{x \ln x} \cdot \left(1 \ln x + x \cdot \frac{1}{x} \right) =$$

$$\| \quad x^x \left(\ln x + 1 \right)$$

(b) $f(x) = x^{\sin x}$

$$f'(x) = f(x) \cdot (\ln f(x))'$$

$$f'(x) = x^{\sin x} \left(\ln x^{\sin x} \right)' =$$

$$= x^{\sin x} \left(\sin x \cdot \ln x \right)' = x^{\sin x} \cdot \left(\cos x \cdot \ln x + \frac{\sin x}{x} \right)$$

(c) $f(x) = (\sin x)^{\cos x}$

$$f'(x) = (\sin x)^{\cos x} \cdot \left(\ln \sin x^{\cos x} \right)' =$$

$$= (\sin x)^{\cos x} \cdot \left(\cos x \cdot \ln \sin x \right)' =$$

$$= (\sin x)^{\cos x} \cdot \left(-\sin x \cdot \ln \sin x + \cos x \cdot \frac{1}{\sin x} \cdot \cos x \right)$$

(4) $f(x) = (x^2+1)^{\operatorname{arctg} x}$

$f'(x) = (x^2+1)^{\operatorname{arctg} x} \cdot \left(\operatorname{arctg} x \cdot \ln(x^2+1)\right)' =$

$= (x^2+1)^{\operatorname{arctg} x} \cdot \left(\frac{\ln(x^2+1)}{1+x^2} + \frac{\operatorname{arctg} x}{x^2+1} \cdot 2x\right)$