10. $y = x^{x+2}, \quad x > 0$

$\ln y = \ln x^{x+2}$

$\ln y = (x+2)\ln x$

$\frac{d}{dx}(\ln y) = \frac{d}{dx}\left[\underbrace{(x+2)}_{P}\ \underbrace{\ln x}_{Q}\right]$

$P' = 1 \quad Q' = \frac{1}{x}$

$P'Q + PQ'$

$\frac{1}{y} \cdot y' = 1 \cdot \ln x + (x+2)\left(\frac{1}{x}\right)$

$\cancel{y} \cdot \left[\frac{1}{\cancel{y}} y'\right] = y\left[\ln x + \frac{x+2}{x}\right]$

$y' = x^{x+2}\left(\ln x + \frac{x+2}{x}\right)$

$y' = x^{x+2}\left(\frac{x\ln x}{x} + \frac{x+2}{x}\right)$

$y' = x^{x+2}\left(\frac{x\ln x + x + 2}{x}\right)$

$y' = \frac{x^{x+2}(x\ln x + x + 2)}{x^1}$

$y' = x^{x+2-1}(x\ln x + x + 2)$

$y' = x^{x+1}(x\ln x + x + 2)$

11. $y = (x-3)^{\ln x}$

$\ln y = \ln(x-3)^{\ln x}$

$\ln y = (\ln x)(\ln(x-3))$

$\frac{d}{dx}(\ln y) = \frac{d}{dx}\left[\underbrace{(\ln x)}_{P}\underbrace{(\ln(x-3))}_{Q}\right]$

$P' = \frac{1}{x} \quad Q' = \frac{1}{x-3} \cdot \frac{d}{dx}(x-3)$

$Q' = \frac{1}{x-3}$

$P'Q + PQ'$

$\frac{1}{y} \cdot y' = \frac{1}{x}(\ln(x-3)) + (\ln x)\left(\frac{1}{x-3}\right)$

$\cancel{y} \cdot \frac{1}{\cancel{y}} y' = y\left[\frac{\ln(x-3)}{x} + \frac{\ln x}{x-3}\right]$

$y' = (x-3)^{\ln x}\left[\frac{\ln(x-3)}{x} + \frac{\ln x}{x-3}\right]$

$= (x-3)^{\ln x}\left[\frac{(x-3)\ln(x-3)}{x(x-3)} + \frac{x\ln x}{x(x-3)}\right]$

$= \frac{(x-3)^{\ln x}\left[(x-3)\ln(x-3) + x\ln x\right]}{x(x-3)}$

$= \frac{(x-3)^{\ln x - 1}\left[(x-3)\ln(x-3) + x\ln x\right]}{x}$