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$$2a) y = (1+x^2)^x \quad \ln y = x \ln(1+x^2)$$

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

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

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

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

$$3) y = x \cdot e^{x^2} \quad \ln y = \ln x + \ln e^{x^2} \Rightarrow \ln y = \ln x + x^2$$

$$\frac{y'}{y} = \frac{1}{x} + 2x \Rightarrow y' = \frac{y}{x} + 2xy \Rightarrow \left| y = x \cdot e^{x^2} \right| \Rightarrow$$

$$\Rightarrow y' = \frac{x \cdot e^{x^2}}{x} + 2x \cdot x \cdot e^{x^2} \Rightarrow y' = e^{x^2} + 2x^2 \cdot e^{x^2} \Rightarrow$$

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

$$\frac{y''}{y'} = 2x + \frac{4x}{1+2x^2} \Rightarrow y'' = 2xy' + \frac{4xy'}{1+2x^2} \Rightarrow \left| y' = e^{x^2} (1+2x^2) \right| \Rightarrow$$

$$\Rightarrow y'' = 2x(1+2x^2)e^{x^2} + \frac{4x(1+2x^2)e^{x^2}}{1+2x^2} \Rightarrow y'' = 2x(1+2x^2)e^{x^2} + 4xe^{x^2} \Rightarrow$$

$$\Rightarrow y'' = 2x \cdot e^{x^2} (1+2+2x^2) \Rightarrow y'' = 2x(2x^2+3)e^{x^2}$$