1 Derivatives of other functions

1. (i) $y = x\ln(x^2+1)$, $\frac{dy}{dx} = x'\ln(x^2+1)+x(\ln(x^2+1))' = \ln(x^2+1)+x\times\frac{1}{x^2+1}\times 2x = \ln(x^2+1)+\frac{2x}{x^2+1}$.

   (ii) $y = \sin(xe^x)$, $\frac{dy}{dx} = \cos(xe^x)\times(xe^x)' = \cos(xe^x)[x'e^x + x(e^x)'] = \cos(xe^x)(e^x + xe^x) = e^x(x+1)\cos(xe^x)$.

2. (i) $y = xe^{x^2+3}$, $\frac{dy}{dx} = x'e^{x^2+3}+x[e^{x^2+3}]' = e^{x^2+3}+xe^{x^2+3}2x = e^{x^2+3}+2x^2e^{x^2+3} = e^{x^2+3}(2x^2+1)$.

   (ii) $y = (4 + x\ln x)^5$, $\frac{dy}{dx} = 5(4 + x\ln x)^4\times(4 + x\ln x)' = 5(4x\ln x)^4[x'\ln x + x(\ln x)'] = 5(4x\ln x)^4(\ln x + x\times\frac{1}{x}) = 5(4x\ln x)^4(\ln x + 1)$.