1. $y = (x^4 - 3x^2 + 5)^3 \Rightarrow$

$y' = 3(x^4 - 3x^2 + 5)^2 \dfrac{d}{dx}(x^4 - 3x^2 + 5) = 3(x^4 - 3x^2 + 5)^2(4x^3 - 6x) = 6x(x^4 - 3x^2 + 5)^2(2x^2 - 3)$

2. $y = \cos(\tan x) \Rightarrow y' = -\sin(\tan x)\dfrac{d}{dx}(\tan x) = -\sin(\tan x)(\sec^2 x)$

3. $y = \sqrt{x} + \dfrac{1}{\sqrt[3]{x^4}} = x^{1/2} + x^{-4/3} \Rightarrow y' = \frac{1}{2}x^{-1/2} - \frac{4}{3}x^{-7/3} = \dfrac{1}{2\sqrt{x}} - \dfrac{4}{3\sqrt[3]{x^7}}$

10. $y = \sin^{-1}(e^x) \Rightarrow y' = \dfrac{1}{\sqrt{1 - (e^x)^2}} \cdot e^x = e^x / \sqrt{1 - e^{2x}}$

11. $y = xe^{-1/x} \Rightarrow y' = xe^{-1/x}(1/x^2) + e^{-1/x} \cdot 1 = e^{-1/x}(1/x + 1)$

12. $y = x^r e^{sx} \Rightarrow y' = x^r(se^{sx}) + e^{sx}(rx^{r-1}) = e^{sx}x^{r-1}(sx + r)$

13. $\dfrac{d}{dx}(xy^4 + x^2 y) = \dfrac{d}{dx}(x + 3y) \Rightarrow x \cdot 4y^3 y' + y^4 \cdot 1 + x^2 \cdot y' + y \cdot 2x = 1 + 3y' \Rightarrow$

$y'(4xy^3 + x^2 - 3) = 1 - y^4 - 2xy \Rightarrow y' = \dfrac{1 - y^4 - 2xy}{4xy^3 + x^2 - 3}$

14. $y = \ln(\csc 5x) \Rightarrow y' = \dfrac{1}{\csc 5x}(-\csc 5x \cot 5x)(5) = -5\cot 5x$

15. $y = \dfrac{\sec 2\theta}{1 + \tan 2\theta} \Rightarrow$

$y' = \dfrac{(1 + \tan 2\theta)(\sec 2\theta \tan 2\theta \cdot 2) - (\sec 2\theta)(\sec^2 2\theta \cdot 2)}{(1 + \tan 2\theta)^2} = \dfrac{2\sec 2\theta\left[(1 + \tan 2\theta)\tan 2\theta - \sec^2 2\theta\right]}{(1 + \tan 2\theta)^2}$

$= \dfrac{2\sec 2\theta(\tan 2\theta + \tan^2 2\theta - \sec^2 2\theta)}{(1 + \tan 2\theta)^2} = \dfrac{2\sec 2\theta(\tan 2\theta - 1)}{(1 + \tan 2\theta)^2} \left[1 + \tan^2 x = \sec^2 x\right]$

16. $\dfrac{d}{dx}(x^2 \cos y + \sin 2y) = \dfrac{d}{dx}(xy) \Rightarrow x^2(-\sin y \cdot y') + (\cos y)(2x) + \cos 2y \cdot 2y' = x \cdot y' + y \cdot 1 \Rightarrow$

$y'(-x^2 \sin y + 2\cos 2y - x) = y - 2x\cos y \Rightarrow y' = \dfrac{y - 2x\cos y}{2\cos 2y - x^2 \sin y - x}$

17. $y = e^{cx}(c\sin x - \cos x) \Rightarrow$

$y' = e^{cx}(c\cos x + \sin x) + ce^{cx}(c\sin x - \cos x)$

$= e^{cx}(c^2 \sin x - c\cos x + c\cos x + \sin x) = e^{cx}(c^2 \sin x + \sin x) = e^{cx}\sin x\,(c^2 + 1)$

18. $y = \ln(x^2 e^x) = \ln x^2 + \ln e^x = 2\ln x + x \Rightarrow y' = 2/x + 1$

24. $y = e^{\cos x} + \cos(e^x) \Rightarrow y' = e^{\cos x}(-\sin x) + [-\sin(e^x) \cdot e^x] = -\sin x\, e^{\cos x} - e^x \sin(e^x)$