1. Let $u = g(x) = 4x$ and $y = f(u) = \sin u$. Then $\dfrac{dy}{dx} = \dfrac{dy}{du}\dfrac{du}{dx} = (\cos u)(4) = 4\cos 4x$.

2. Let $u = g(x) = 4 + 3x$ and $y = f(u) = \sqrt{u} = u^{1/2}$. Then $\dfrac{dy}{dx} = \dfrac{dy}{du}\dfrac{du}{dx} = \frac{1}{2}u^{-1/2}(3) = \dfrac{3}{2\sqrt{u}} = \dfrac{3}{2\sqrt{4+3x}}$.

3. Let $u = g(x) = 1 - x^2$ and $y = f(u) = u^{10}$. Then $\dfrac{dy}{dx} = \dfrac{dy}{du}\dfrac{du}{dx} = (10u^9)(-2x) = -20x(1-x^2)^9$.

4. Let $u = g(x) = \sin x$ and $y = f(u) = \tan u$. Then $\dfrac{dy}{dx} = \dfrac{dy}{du}\dfrac{du}{dx} = (\sec^2 u)(\cos x) = \sec^2(\sin x)\cdot\cos x$, or equivalently, $[\sec(\sin x)]^2 \cos x$.

5. Let $u = g(x) = \sqrt{x}$ and $y = f(u) = e^u$. Then $\dfrac{dy}{dx} = \dfrac{dy}{du}\dfrac{du}{dx} = (e^u)\left(\frac{1}{2}x^{-1/2}\right) = e^{\sqrt{x}}\cdot\dfrac{1}{2\sqrt{x}} = \dfrac{e^{\sqrt{x}}}{2\sqrt{x}}$.

6. Let $u = g(x) = e^x$ and $y = f(u) = \sin u$. Then $\dfrac{dy}{dx} = \dfrac{dy}{du}\dfrac{du}{dx} = (\cos u)(e^x) = e^x \cos e^x$.

7. $F(x) = \sqrt[4]{1+2x+x^3} = (1+2x+x^3)^{1/4} \quad \Rightarrow$

$$F'(x) = \tfrac{1}{4}(1+2x+x^3)^{-3/4}\cdot\frac{d}{dx}\left(1+2x+x^3\right) = \frac{1}{4(1+2x+x^3)^{3/4}}\cdot(2+3x^2)$$

$$= \frac{2+3x^2}{4(1+2x+x^3)^{3/4}} = \frac{2+3x^2}{4\sqrt[4]{(1+2x+x^3)^3}}$$

8. $F(x) = (x^2 - x + 1)^3 \quad \Rightarrow \quad F'(x) = 3(x^2-x+1)^2(2x-1)$

9. $g(t) = \dfrac{1}{(t^4+1)^3} = (t^4+1)^{-3} \quad \Rightarrow \quad g'(t) = -3(t^4+1)^{-4}(4t^3) = -12t^3(t^4+1)^{-4} = \dfrac{-12t^3}{(t^4+1)^4}$

10. $f(t) = \sqrt[3]{1+\tan t} = (1+\tan t)^{1/3} \quad \Rightarrow \quad f'(t) = \frac{1}{3}(1+\tan t)^{-2/3}\sec^2 t = \dfrac{\sec^2 t}{3\sqrt[3]{(1+\tan t)^2}}$

11. $y = \cos(a^3 + x^3) \quad \Rightarrow \quad y' = -\sin(a^3+x^3)\cdot 3x^2$ [a^3 is just a constant] $= -3x^2\sin(a^3+x^3)$

12. $y = a^3 + \cos^3 x \quad \Rightarrow \quad y' = 3(\cos x)^2(-\sin x)$ [a^3 is just a constant] $= -3\sin x\cos^2 x$

13. $h(t) = t^3 - 3^t \quad \Rightarrow \quad h'(t) = 3t^2 - 3^t \ln 3$ [by Formula 5]

14. $y = 3\cot(n\theta) \quad \Rightarrow \quad y' = 3[-\csc^2(n\theta)\cdot n] = -3n\csc^2(n\theta)$

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

16. $y = e^{-5x}\cos 3x \quad \Rightarrow \quad y' = e^{-5x}(-3\sin 3x) + (\cos 3x)(-5e^{-5x}) = -e^{-5x}(3\sin 3x + 5\cos 3x)$