1. $y = \sin 8x \qquad y = \sin u \qquad u = 8x$

$\frac{dy}{du} = \cos u \qquad \frac{du}{dx} = 8 \qquad \boxed{\frac{dy}{dx} = 8\cos 8x}$

2. $y = \frac{\sin x}{x^3} \qquad y' = \frac{x^3\cos x - 3x^2 \sin x}{x^6} = \boxed{\frac{x\cos x - 3\sin x}{x^4}}$

3. $y = \cos^4 x \qquad y = u^4 \qquad u = \cos x$

$\frac{dy}{du} = 4u^3 \qquad \frac{du}{dx} = -\sin x \qquad \boxed{\frac{dy}{dx} = -4\cos^3 x \sin x}$

4. $y = 3\sec\left(\frac{1}{2}x\right) \qquad y = 3\sec u \qquad u = \frac{1}{2}x$

$\frac{dy}{du} = 3\sec u \tan u \qquad \frac{du}{dx} = \frac{1}{2}$

$\boxed{\frac{dy}{dx} = \frac{3}{2}\sec\frac{1}{2}x \tan\frac{1}{2}x}$

5. $y = (\cot x)(\sin 2x) \qquad y' = \cot x(2\cos 2x) + (\sin 2x)(-\csc^2 x)$

$= \boxed{2\cot x \cos 2x - \sin 2x \csc^2 x}$

or

$y = \frac{\cos x(2\sin x\cos x)}{\sin x} = 2\cos^2 x \qquad y' = 4\cos x(-\sin x)$

$= \boxed{-4\sin x\cos x}$

6. $y = 2x^3 \csc x \qquad y' = 2x^3(-\csc x\cot x) + 6x^2\csc x$

$= \boxed{2x^2\csc x(3 - x\cot x)}$

7. $y = \sqrt{\sin x} \qquad y = \sqrt{u} \qquad u = \sin x$

$\frac{dy}{du} = \frac{1}{2\sqrt{u}} \qquad \frac{du}{dx} = \cos x \qquad \boxed{\frac{dy}{dx} = \frac{\cos x}{2\sqrt{\sin x}}}$

8. $y=(3x^2-5x+1)^7$ $\boxed{y' = 7(3x^2-5x+1)^6(6x-5)}$

9. $y=\dfrac{\tan 2x}{2x}$ $y' = \dfrac{2x(2\sec^2 2x) - 2\tan 2x}{(2x)^2}$

$= \dfrac{4x\sec^2 2x - 2\tan 2x}{4x^2} = \boxed{\dfrac{2x\sec^2 2x - \tan 2x}{2x^2}}$

10. $y=\cos^4(x^2)$ $y = u^4$ $u = \cos(x^2)$

$u = \cos v$ $v = x^2$

$\dfrac{dy}{dx} = 4u^3(-\sin v)(2x) = \boxed{-8x\cos^3(x^2)\sin(x^2)}$

11. $y=3x^2\sin 4x$ $y' = 3x^2(4\cos 4x) + 6x\sin 4x = \boxed{12x^2\cos 4x + 6x\sin 4x}$

12. $y=\sqrt{x^2-1}\,(\sin x)$ $y' = \sqrt{x^2-1}\,(\cos x) + \dfrac{2x\sin x}{2\sqrt{x^2-1}}$

$= \boxed{\sqrt{x^2-1}\,(\cos x) + \dfrac{x\sin x}{\sqrt{x^2-1}}}$

13. $y=(\sin 5x)(\cos 6x)$ $y' = (\sin 5x)(-6\sin 6x) + (\cos 6x)(5\cos 5x)$

$= \boxed{5\cos 5x\cos 6x - 6\sin 5x\sin 6x}$

14. $y=\dfrac{\sin 2x}{\cos 3x}$ $y' = \dfrac{(\cos 3x)(2\cos 2x) - (\sin 2x)(-3\sin 3x)}{\cos^2 3x}$

$= \boxed{\dfrac{2\cos 3x\cos 2x + 3\sin 2x\sin 3x}{\cos^2 3x}}$

15. $y=(x^2\tan 2x)^3$

$y' = 3(x^2\tan 2x)^2\left[x^2(2\sec^2 2x) + 2x\tan 2x\right]$

$= \boxed{6x(x^2\tan 2x)^2(x\sec^2 2x + \tan 2x)}$