1. $$\begin{aligned} h'(x) &= f'(g(x))g'(x) \\ h'(3) &= f'(g(3))g'(3) \\ &= f'(2) \cdot 5 \\ &= 30 \end{aligned}$$

2. $$\begin{aligned} p'(x) &= q'(r(x))r'(x) \\ p'(8) &= q'(r(8))r'(8) \\ &= q'(3) \cdot -2 \\ &= 8 \end{aligned}$$

3. $$\begin{aligned} t'(p) &= u'(v(w(p)))v'(w(p))w'(p) \\ t'(5) &= u'(v(w(5)))v'(w(5))w'(5) \\ &= u'(v(-3))v'(-3) \cdot 6 \\ &= u'(4) \cdot 2 \cdot 6 \\ &= 12 \cdot 2 \cdot 6 \\ &= 144 \end{aligned}$$

4. $\dfrac{dy}{dx} = 3x^2 - 2x \sin x^2$

5. $$\begin{aligned} f'(x) &= [\cos(\cos x^3)][-\sin x^3][3x^2] \\ &= -3x^2 \sin x^3 \cos(\cos x^3) \end{aligned}$$

6. $g'(x) = [8 \sec^7(5x^3 - 17x)][\sec(5x^3 - 17x) \tan(5x^3 - 17x)][15x^2 - 17]$

7. $\dfrac{dy}{dx} = [2 \csc(\cos^2 x)][-\csc(\cos^2 x) \cot(\cos^2 x)][-2 \cos x \sin x]$

8. $$\begin{aligned} h'(x) &= \frac{1}{2}(x-1)^{-1/2} + \frac{1}{2}(x+1)^{-1/2} \\ &= \frac{1}{2\sqrt{x-1}} + \frac{1}{2\sqrt{x+1}} \end{aligned}$$

9. $$\begin{aligned} \frac{dy}{dx} &= [x^2][\sec^2 x^{-1}][-x^{-2}] + [\tan x^{-1}][2x] \\ &= 2x \tan \frac{1}{x} - \frac{x^2 \sec^2 \frac{1}{x}}{x^2} \end{aligned}$$

10. $$\frac{dy}{dx} = -\frac{1}{2}(\cos x)^{-3/2}(-\sin x)$$
$$= \frac{\sin x}{2\sqrt{\cos^3 x}}$$

11. $\dfrac{dp}{dx} = \dfrac{1}{3}\left(\dfrac{x-3}{2x+5}\right)^{-2/3}\left[\dfrac{(2x+5)(1)-(x-3)(2)}{(2x+5)^2}\right]$ (No need to simplify further.)

12. $\dfrac{dw}{dv} = \dfrac{(v^2+1)\left(\frac{1}{2}v^{-1/2}\right) - (\sqrt{v}+1)\,2v}{(v^2+1)^2}$ (No need to simplify further.)

13. $\dfrac{dy}{dx} = -\sin(\sin(\tan x))\cos(\tan x)\sec^2 x$

14. $$f'(x) = \left[-\sin\sqrt{\tan^3 x}\right]\left[\frac{1}{2}\left(\tan^3 x\right)^{-1/2}\right]\left[3\tan^2 x\right]\left[\sec^2 x\right]$$
$$= \frac{-3\tan^2 x\sec^2 x\sin\left(\sqrt{\tan^3 x}\right)}{2\sqrt{\tan^3 x}}$$

15. $f'(x) = n\,[g(x)]^{n-1}\,g'(x)$

16. $g'(x) = f'(\tan x)\sec^2 x$

17. $h'(x) = f'(\sec^4 x)(4\sec^3 x)(\sec x\tan x)$

18. $h'(x) = f(x)\cdot 5g(x)^4 g'(x) + g(x)^5\cdot f'(x)$

19. $g'(x) = f'(g(\sin x))g'(\sin x)\cos x$

20. $h'(x) = f'\left([g(x)]^2\right)\cdot 2g(x)g'(x)$

21. $$\begin{aligned} f'(x) &= g(x)h'(x) + h(x)g'(x) \\ f'(5) &= g(5)h'(5) + h(5)g'(5) \\ &= (-3)(-2) + (3)(6) \\ &= 24 \end{aligned}$$

22. $$\begin{aligned} f'(x) &= g'(h(x))h'(x) \\ f'(5) &= g'(h(5))h'(5) \\ &= g'(3)\cdot -2 \end{aligned}$$
Not possible. We need $g'(3)$.

23. $$\begin{aligned} f'(x) &= \frac{h(x)g'(x) - g(x)h'(x}{[h(x)]^2} \\ f'(5) &= \frac{h(5)g'(5) - g(5)h'(5}{[h(5)]^2} \\ &= \frac{(3)(6) - (-3)(-2)}{9} \\ &= \frac{4}{3} \end{aligned}$$

24. $$\begin{aligned} f'(x) &= 3[g(x)]^2 g'(x) \\ f'(5) &= 3[g(5)]^2 g'(5) \\ &= 3(-3)^2(6) \\ &= 162 \end{aligned}$$

25. $f'(x) = g'(x^2+4x)(2x+4)$

26. $g'(x) = f'(x)$

$r'(x) = f'(-3x)(-3)$

$h'(x) = 2f'(x)$

$s'(x) = f'(x+2)(1)$

x	-2	-1	0	1	2	3
f'(x)	-2	2/3	-1/3	-1	-2	-4
g'(x)	-2	2/3	-1/3	-1	-2	-4
h'(x)	-4	4/3	-2/3	-2	-4	-8
r'(x)	can't	12	1	can't	can't	can't
s'(x)	-1/3	-1	-2	-4	can't	can't