Differentiate

1. $r(t) = (5t-4)^2$
2. $h(t) = \frac{\sin t}{\cos t}$
3. $q = \sin^2(\cos(x))$
4. $q = \frac{t^2+7t-1}{2t^2-3t-7}$
5. $y = \frac{\frac{2}{3x}-1}{\frac{3}{x^2}+5}$
6. $f(x) = \frac{5x-2}{x^2+1}$
7. $y = (1-4x+7x^5)^{30}$
8. $s(t) = \sec^2 t$
9. $w = (-x-7)(-2x^3-3x^2-7x-9)$
10. $h(x) = \left(\sqrt[24]{x^{23}}\right)\left(\frac{1}{\sqrt{x}}\right)$
11. $y = (2x-3)^{10}$
12. $f(x) = \frac{3}{\sqrt{2x+4}}$
13. $f(x) = (\sqrt[3]{x}+2x)(3+x^2)$
14. $y = (5x-2)\sqrt{3x+4}$
15. $y = \sqrt[3]{\frac{2x+3}{3x-5}}$
16. $y = (x^3-3x)(2x^2+3x+5)$
17. $y = \sin(5x)$
18. $y = t^2\sqrt[3]{3t+4}$
19. $y = 5x^2\sin(x)$
20. $x = \frac{-5}{(3y^2-4)^6}$
21. Assume that $h(x) = f(g(x))$, where both f and g are differentiable functions. If $g(-1) = 2$, $g'(-1) = 3$, and $f'(2) = -4$, what is the value of $h'(-1)$?

Solutions

1. $r'(t) = 50t - 40$
2. $h'(t) = 1 + \frac{\sin^2 t}{\cos^2 t} = 1 + \tan^2 t$
3. $\frac{dq}{dx} = -2\sin(x)\sin(\cos(x))\cos(\cos(x))$
   $= -\sin(2\cos(x))\sin x$
4. $\frac{dq}{dt} = -\frac{(17t^2+10t+52)}{(2t^2-3t-7)^2}$
5. $\frac{dy}{dx} = -\left(\frac{2}{3}\right)\left(\frac{5x^2+9x-3}{(5x^2+3)^2}\right)$
6. $f'(x) = -\frac{(5x^2-4x-5)}{(x^2+1)^2}$
7. $\frac{dy}{dx} = 30(7x^5-4x+1)^{29}(35x^4-4)$
8. $s'(t) = \frac{2\sin t}{\cos^3 t} = 2\tan t\sec^2 t$
9. $\frac{dw}{dx} = 8x^3+51x^2+56x+58$
10. $h'(x) = \frac{11}{24x^{13/24}}$
11. $\frac{dy}{dx} = 20(2x-3)^9$
12. $f'(x) = -\frac{3}{2(x+2)\sqrt{2x+4}}$
13. $f'(x) = \frac{7x^2+18x^{8/3}+18x^{2/3}+3}{3x^{2/3}}$
14. $\frac{dy}{dx} = \frac{45x+34}{\sqrt{3x+4}}$
15. $\frac{dy}{dx} = -\frac{19}{3\left(\frac{2x+3}{3x-5}\right)^{2/3}(3x-5)^2}$
16. $\frac{dy}{dx} = 10x^4+12x^3-3x^2-18x-15$
17. $\frac{dy}{dx} = 5\cos(5x)$
18. $\frac{dy}{dt} = \frac{t(7t+8)}{(3t+4)^{2/3}}$
19. $\frac{dy}{dx} = 5x\,(x\cos(x)+2\sin(x))$
20. $\frac{dx}{dy} = \frac{180y}{(3y^2-4)^7}$
21. $h'(-1) = -12$