Differentiation - Chain Rule - Power

Find $f'(x)$.

1. $f(x) = \left(3x^4 - \cos x + 2e^{7x} - 17\ln x\right)^5$

$$f'(x) = 5\left(3x^4 - \cos x + 2e^{7x} - 17\ln x\right)^4 \left(12x^3 + \sin x + 14\,e^{7x} - \frac{17}{x}\right)$$

2. $f(x) = (\ln x)^3 \longrightarrow f'(x) = 3\,(\ln x)^2 \left(\frac{1}{x}\right) = \frac{3\,(\ln x)^2}{x}$

3. $f(x) = 5\left(\sin^{-1} x\right)^4 \longrightarrow f'(x) = 5(4)\left(\sin^{-1} x\right)^3 \left(\frac{1}{\sqrt{1-x^2}}\right) = \frac{20\left(\sin^{-1} x\right)^3}{\sqrt{1-x^2}}$

4. $f(x) = (3x+1)^4 \longrightarrow f'(x0 = 4(3x+1)^3(3) = 12(3x+1)^3$

5. $f(x) = \frac{1}{3x+1} = (3x+1)^{-1} \longrightarrow f'(x) = -1(3x+1)^{-2}(3) = -\frac{3}{(lx+1)^2}$

6. $f(x) = \frac{1}{(3x+1)^2} = (3x+1)^{-2} \longrightarrow f'(x) = -2(3x+1)^{-3}(3) = -\frac{6}{(3x+1)^3}$

7. $f(x) = \frac{1}{x^2+1} = \left(x^2+1\right)^{-1} \longrightarrow f'(x) = -1\left(x^2+1\right)^{-2}(2x) = -\frac{2x}{\left(x^2+1\right)^2}$

8. $f(x) = \frac{1}{5\left(x^2+1\right)^2} = \frac{1}{5}\left(x^2+1\right)^{-2} \longrightarrow f'(x) = -\frac{2}{5}\left(x^2+1\right)^{-3}(2x) = -\frac{4x}{5\left(x^2+1\right)^3}$

9. $f(x) = \frac{1}{7\left(x^2+1\right)^3} = \frac{1}{7}\left(x^2+1\right)^{-3} \longrightarrow f'(x) = -\frac{3}{7}\left(x^2+1\right)^{-4}(2x) = -\frac{6x}{7\left(x^2+1\right)^4}$

10. $f(x) = \frac{1}{\left(x^2+1\right)^4} = \left(x^2+1\right)^{-4} \longrightarrow f'(x) = -4\left(x^2+1\right)^{-5}(2x) = -\frac{8x}{\left(x^2+1\right)^5}$