1. $f(x) = e^{\sqrt{\frac{x+1}{x-1}}}$

$$f'(x) = e^{\sqrt{\frac{x+1}{x-1}}} \cdot \frac{1}{2\sqrt{\frac{x+1}{x-1}}} \cdot \left(\frac{1(x-1) - (1)(x+1)}{(x-1)^2} \right)$$

2. $f(x) = \sqrt{\ln(\sqrt{x})}$

$$f'(x) = \frac{1}{2\sqrt{\ln\sqrt{x}}} \cdot \frac{1}{\sqrt{x}} \cdot \frac{1}{2\sqrt{x}}$$

3. $f(x) = \ln(1 + \sqrt{x+1}) - \sqrt{x+1}$

$$f'(x) = \left(\frac{1}{1+\sqrt{x+1}} \cdot \frac{1}{2\sqrt{x+1}} \cdot 1 \right) - \frac{1}{2\sqrt{x+1}} \cdot 1$$

4. $2e^x \cos x$

$$2\frac{d}{dx}\left(e^x \cos x \right) = 2\left(e^x (\cos x) + (e^x(-\operatorname{sen} x)) \right)$$

$$= 2(e^x \cos x - e^x \operatorname{sen} x)$$

$$= 2e^x \cos x - 2e^x \operatorname{sen} x$$

5. $(x^2 + 5x + 3)\ln x$

$$(2x+5)(\ln x) + \frac{(x^2+5x+3)}{x}$$

$$(2x+5)(\ln x) + \frac{x^{\cancel{2}}}{\cancel{x}} + \frac{5\cancel{x}}{\cancel{x}} + \frac{3}{x}$$

$$(2x+5)(\ln x) + x + 5 + \frac{3}{x}$$

9. $\lim_{h \to 0} \dfrac{\dfrac{2}{x+h+1} - \dfrac{2}{x+1}}{h} = \lim_{h \to 0} \dfrac{\dfrac{\cancel{2x}+\cancel{2}-\cancel{2x}-2h-\cancel{2}}{(x+h+1)(x+1)}}{h}$

$= \lim_{h \to 0} \dfrac{-2\cancel{h}}{\cancel{h}(x+h+1)(x+1)} = \lim_{h \to 0} \dfrac{-2}{(x+h+1)(x+1)} = \dfrac{-2}{(x+0+1)(x+1)} = \dfrac{-2}{(x+1)^2}$

10. $f(x) = \dfrac{3x-5}{x^2-1}$

$f'(x) = \dfrac{(3)(x^2-1) - (2x)(3x-5)}{(x^2-1)} = \dfrac{3x^2-3-6x^2+10x}{(x^2-1)^2} = \dfrac{-3x^2+10x-3}{(x^2-1)^2}$

11. $f(x) = \dfrac{1}{x^3-x} = (x^3-x)^{-1} = -1(x^3-x)^{-2} \cdot 3x^2-1$

$= \dfrac{3x^2-1}{-(3x-x)^2} = \dfrac{-3x^2+1}{(3x-x)^2}$

12. $f(x) = \dfrac{x^2-4}{(x-4)(x-3)(x-2)} = \dfrac{(x+2)\cancel{(x-2)}}{(x-4)(x-3)\cancel{(x-2)}}$

$f(x) = \dfrac{x+2}{(x-4)(x-3)} = \dfrac{x+2}{x^2-7x+12}$

$f(x) = \dfrac{(1)(x^2-7x+12) - [(2x-7)(x+2)]}{(x^2-7x+12)^2} = \dfrac{x^2-\cancel{7x}+12-(2x^2+4x-\cancel{7x}-14)}{(x^2-7x+12)^2}$

$= \dfrac{-x^2+4x+26}{(x^2-7x+12)^2}$

13. $y = \dfrac{e^x}{x+e^x}$ $\quad y' = \dfrac{e^x(x+e^x) - (1+e^x)(e^x)}{(x+e^x)^2}$

$= \dfrac{xe^x + \cancel{e^{2x}} - e^x - \cancel{e^{2x}}}{(x+e^x)^2} = \dfrac{e^x(x-1)}{(x+e^x)^2}$

14. $y = \dfrac{e^x - 1}{e^x + 8}$ $\quad y' = \dfrac{(e^x)(e^x+8) - [(e^x)(e^x-1)]}{(e^x+8)^2} = \dfrac{\cancel{e^{2x}} + 8e^x - \cancel{e^{2x}} + e^x}{(e^x+8)^2}$

$= \dfrac{9e^x}{(e^x+8)^2}$

15. $y = \dfrac{e^{2x}}{\sqrt{x}} = \dfrac{(e^x)^2}{\sqrt{x}}$ $\quad y' = \dfrac{(2e^{2x} \cdot e^x)(\sqrt{x}) - (\frac{1}{2x} \cdot e^{2x})}{x}$

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

$y' = 2(\tan(x^2+3x)) \cdot \sec^2(x^2+3x) \cdot 2x+3$

$= (4x+6)(\tan(x^2+3x))(\sec^2(x^2+3x))$

17. $y = \cos\left(\frac{x+1}{x-1}\right)$

$y' = -\text{sen}\left(\frac{x+1}{x-1}\right) \cdot \left(\dfrac{-2}{(x-1)^2}\right) = \dfrac{2}{(x-1)^2}\,\text{sen}\left(\frac{x+1}{x-1}\right)$

19 $y = \text{sen}\left(\sqrt{3x^2+1}\right)$

$y' = \cos\left(\sqrt{3x^2+1}\right)\left(\dfrac{1}{2\sqrt{3x^2+1}}\right)\left(6x\right)$

$= \dfrac{3x}{\sqrt{3x^2-1}} \cos\left(\sqrt{3x^2+1}\right)$

20 obtener f^{v} de $x^4 - \dfrac{10}{x}$ $\quad x^4 - 10x^{-1}$

$f'(x) = 4x^3 + 10x^{-2}$

$f''(x) = 12x^2 - 20x^{-3}$

$f'''(x) = 24x + 60x^{-4}$

$f^{IV}(x) = 24 - 240x^{-5}$

$f^{V}(x) = 1200x^{-6}$

21 Obtener $f''(x)$ de $\dfrac{1-e^x}{2+e^x}$

$f'(x) = \dfrac{(-e^x)(2+e^x) - (e^x)(1-e^x)}{(2+e^x)^2}$

$= \dfrac{-2e^x - \cancel{e^{2x}} - e^x + \cancel{e^{2x}}}{(2+e^x)^2} = \dfrac{-3e^x}{(2+e^x)^2}$

$f''(x) = \dfrac{(-3e^x)\cdot(2+e^x)^2 - (2(e^x))(-3e^x)}{(2+e^x)^4}$

$=$

22. $f(x) = (9-x^2)^{2/3}$

$f'(x) = \frac{2}{3}(9-x^2)^{-1/3} \cdot -2x$

23. $f(x) = (x^2+1)^{-2}$

$f'(x) = -2(x^2+1)^{-3} \cdot 2x$

$= \frac{-4x}{(x^2+1)^3}$

24. $y = (2x^2+4x+3)^{50}$

$y' = 50(2x^2+4x+3)^{49} \cdot (4x+4)$

$y' = 50(4)(2x^2+4x+3)(x+1)$

25. $y = \sqrt{\frac{2x}{x+1}}$

$y' = \frac{1}{2\sqrt{\frac{2x}{x+1}}}\left(\frac{\cancel{2x}+2-\cancel{2x}}{(x+1)^2}\right) =$

26. $f(x) = \ln[\cos(4x^3+x)]$

$f'(x) = \frac{1}{\cos(4x^3+x)}\left(-\operatorname{sen}(4x^3+x)\right)\left(12x^2+1\right)$

$= \frac{-\operatorname{sen}(4x^3+x)}{\cos(4x^3+x)}\left(12x^2+1\right)$

$= -\tan(4x^3+x)(12x^2+1)$

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27. $f(x) = \ln\left(\frac{x^4}{x^3-3}\right)$

$$f'(x) = \frac{1}{\left(\frac{x^4}{x^3-3}\right)} \left(\frac{(4x^3)(x^3-3) - [(3x^2)(x^4)]}{(x^3-3)^2}\right)$$

28. $\ln(\ln(3x^3))$

$$f'(x) = \frac{1}{\ln(3x^3)} \cdot \frac{1}{3x^3} \cdot 9x^2 = \frac{9\cancel{x^2}}{3\cancel{x^3}\ln(3x^3)} = \frac{3}{x\ln(3x^3)}$$