DERIBATUAK.

8. orrialdea.

1.) $f(x) = 2x + 1 \longrightarrow f'(x) = \boxed{2}$

2.) $f(x) = \frac{3x-2}{4} = \frac{3x}{4} - \frac{2}{4} = \frac{3x}{4} - \frac{1}{2} \longrightarrow f'(x) = \boxed{\frac{3}{4}}$

3.) $f(x) = \frac{3}{4} \longrightarrow f(x) = \boxed{0}$

4.) $f(x) = \frac{x}{2} + 3 = \frac{1}{2}x + 3 \longrightarrow f'(x) = \boxed{\frac{1}{2}}$

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

6.) $f(x) = \frac{3x^5}{5} - \frac{4x}{3} + 5 = \frac{3}{5}x^5 - \frac{4}{3}x + 5 \longrightarrow f'(x) = \frac{3 \cdot \cancel{5}}{\cancel{5}}x^4 - \frac{4}{3} = \boxed{3x^4 - \frac{4}{3}}$

7.) $f(x) = \frac{4\pi - 2}{3} \longrightarrow f'(x) = \boxed{0.}$

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

9.) $\frac{x^2}{5} - \frac{x}{4} + \sqrt{5} \longrightarrow f'(x) = \boxed{\frac{2x}{5} - \frac{1}{4}}$

10.) $\frac{x}{7} - \sqrt{7x} = \frac{1}{7}x - \sqrt{7} \cdot x^{1/2} \longrightarrow f'(x) = \frac{1}{7} - \frac{\sqrt{7}}{2}x^{\frac{1}{2}-1} = \frac{1}{7} - \underbrace{\frac{\sqrt{7}}{2\sqrt{x}} \cdot \frac{\sqrt{x}}{\sqrt{x}}}$

$= \frac{1}{7} - \frac{\sqrt{7x}}{2x} = \boxed{\frac{2x - 7\sqrt{7x}}{7x}}$

11.) $f(x) = \frac{1}{x} = x^{-1} \longrightarrow f'(x) = -(1)x^{-2} = \boxed{\frac{-1}{x^2}}$

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

13.) $f(x) = \frac{5}{3x^3} = \frac{5}{3} \cdot x^{-3} \longrightarrow f'(x) = \frac{5(-3)}{3}x^{-4} = \boxed{\frac{-5}{x^4}}$

14.) $f(x) = \sqrt[3]{x^4} = x^{4/3} \longrightarrow f'(x) = \frac{4}{3}x^{\frac{4}{3}-1} = \frac{4}{3}x^{1/3} = \boxed{\frac{4\sqrt[3]{x}}{3}}$

15.) $f(x) = \frac{\sqrt{3x}}{x^2} = \frac{\sqrt{3} \cdot \sqrt{x}}{x^2} \longrightarrow f'(x) = \sqrt{3}\left(-\frac{3}{2}\right) \cdot x^{-3/2-1} =$

$= \sqrt{3}\,x^{1/2-2} = \sqrt{3} \cdot x^{-3/2}$

$-\frac{3\sqrt{3}}{2}x^{-5/2} = \frac{-3\sqrt{3}}{2\sqrt{x^5}} =$

$= \frac{-3\sqrt{3}}{2x^2\sqrt{x}} \cdot \frac{\sqrt{x}}{\sqrt{x}} = \boxed{\frac{-3\sqrt{3x}}{2x^3}}$

(2)

16) $f(x) = \frac{3\sqrt{x^3}}{2x^4} = \frac{3}{2} x^{3/2-4} = \frac{3}{2} \cdot x^{-5/2} \longrightarrow f'(x) = \frac{3}{2}\left(-\frac{5}{2}\right) \cdot x^{-5/2-1} =$

$= \frac{-15}{4} \cdot x^{-7/2} = \frac{-15}{4\sqrt{x^7}} = \frac{-15}{4x^3\sqrt{x}} \cdot \frac{\sqrt{x}}{\sqrt{x}}$

$= \boxed{\frac{-15\sqrt{x}}{4x^4}}$

17) $f(x) = \frac{2}{x} + \frac{x}{2} = 2x^{-1} + \frac{1}{2}x \longrightarrow f'(x) = 2\cdot(-1)x^{-2} + \frac{1}{2} = \boxed{\frac{-2}{x^2} + \frac{1}{2}}$

18.) $f(x) = \frac{\sqrt[3]{x^2}}{3} - \frac{x}{3} + \sqrt{5} = \frac{1}{3} \cdot x^{2/3} - \frac{1}{3} \cdot x + \sqrt{5}$

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

$= \frac{2\sqrt[3]{x^2}}{9x} - \frac{1}{3} = \boxed{\frac{2\sqrt[3]{x^2} - 3x}{9x}}$

19.) $f(x) = \sqrt[4]{\frac{1}{x^3}} = x^{-3/4} \longrightarrow f'(x) = -\frac{3}{4} x^{-3/4-1} = -\frac{3}{4} x^{-7/4} =$

$= \frac{-3}{4\sqrt[4]{x^7}} = \frac{-3}{4x\sqrt[4]{x^3}} \cdot \frac{\sqrt[4]{x}}{\sqrt[4]{x}} = \frac{-3\sqrt[4]{x}}{4x^2}$

20.) $f(x) = \sqrt{\frac{3}{x^5}} = \sqrt{3} \cdot x^{-5/2} \longrightarrow f'(x) = \sqrt{3} \cdot \left(\frac{-5}{2}\right) x^{-\frac{5}{2}-1} = \frac{-5\sqrt{3}}{2\sqrt{x^7}} =$

$= \frac{-5\sqrt{3}}{2x^3\sqrt{x}} \cdot \frac{\sqrt{x}}{\sqrt{x}} = \boxed{\frac{-5\sqrt{3x}}{2x^4}}$

21.) $f(x) = \frac{2\sqrt{x}}{x} - \frac{3}{x^2} + \frac{1}{x} = 2x^{\frac{1}{2}-1} - 3x^{-2} + x^{-1} = 2x^{-1/2} - 3x^{-2} + x^{-1}$

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

$= -x^{-3/2} + 6x^{-3} - x^{-2} = -\frac{1}{\sqrt{x^3}} + \frac{6}{x^3} - \frac{1}{x^2}$

$= -\frac{1}{x\sqrt{x}} \cdot \frac{\sqrt{x}}{\sqrt{x}} + \frac{6}{x^3} - \frac{1}{x^2} = \boxed{\frac{-\sqrt{x}}{x^2} + \frac{6}{x^3} - \frac{1}{x^2}}$

22.) $f(x) = x - \frac{3\sqrt{5}}{4} + \frac{1}{x^2} = x - \frac{3\sqrt{5}}{4} + x^{-2}$

$f'(x) = 1 - 0 + (-2)x^{-2-1} = 1 - 2x^{-3} = \boxed{1 - \frac{2}{x^3}}$

23.) $f(x) = \frac{x^2}{3} - \frac{3}{x^2} + \frac{3\sqrt{5}}{2} = \frac{1}{3}x^2 - 3\cdot x^{-2} + \frac{3\sqrt{5}}{2}$

$f'(x) = \frac{2}{3}x - 3(-2)x^{-3} + 0 = \boxed{\frac{2x}{3} + \frac{6}{x^3}}$

24.) $f(x) = \frac{x^3}{3} - 4\sqrt{x} - \frac{2}{x^3} - \underbrace{x^2\sqrt{x}} = \frac{1}{3}x^3 - 4\cdot x^{1/2} - 2x^{-3} - x^{\overset{5/2}{2+1/2}}$

$f'(x) = \frac{1}{\cancel{3}}\cdot\cancel{3}\cdot x^2 - \frac{4}{2}x^{\overset{-1/2}{\frac{1}{2}-1}} - 2(-3)x^{-4} - \frac{5}{2}x^{\overset{3/2}{5/2-1}} = \boxed{x^2 - \frac{2}{\sqrt{x}} + \frac{6}{x^4} - \frac{5}{2}\sqrt{x^3}}$

25.) $f(x) = \frac{x^2-3x+1}{x} = \frac{x^2}{x} - \frac{3x}{x} + \frac{1}{x} = x - 3 + \underbrace{\frac{1}{x}}_{x^{-1}}$

$f'(x) = 1 - 0 + (-1)x^{-1-1} = 1 - x^{-2} = 1 - \frac{1}{x^2} = \boxed{\frac{x^2-1}{x^2}}$

10. orrialdea

1) $f(x) = 3\sin x - 2\cos x \longrightarrow f'(x) = 3\cos x + 2\sin x$

2) $f(x) = 4\,tg\,x + e^x \longrightarrow f'(x) = \frac{4}{\cos^2 x} + e^x$

3) $f(x) = x\cdot \ln x \xrightarrow{\text{Biderketa}} f'(x) = \overset{f'g}{1\cdot \ln x} + \overset{fg'}{x\cdot\frac{1}{x}} = \boxed{\ln x + 1}$

4) $f(x) = x\cdot e^x \longrightarrow f'(x) = 1\cdot e^x + x\cdot e^x = \boxed{e^x(1+x)}$

5) $f(x) = (x^2+1)\cdot\sin x \longrightarrow f'(x) = 2x\cdot\sin x + (x^2+1)\cdot\cos x$

6) $f(x) = 2^x\cdot tg\,x \longrightarrow f'(x) = 2^x\ln 2\cdot tg\,x + \frac{2^x}{\cos^2 x}$.

7.) $f(x) = x^2 - \underbrace{\frac{x}{3}e^x}_{\text{BİDERK.}} \longrightarrow f'(x) = 2x - \left(\overset{f'g}{\frac{1}{3}e^x} + \overset{fg'}{\frac{x}{3}e^x}\right)$

$$\boxed{f'(x) = 2x - \frac{1}{3}e^x - \frac{x}{3}e^x}$$

8.) $f(x) = \underbrace{(x^3 - 2x + 1)}_{f} \cdot \underbrace{\cos x}_{g} \longrightarrow f'(x) = \overset{f'}{(3x^2 - 2)} \cdot \overset{g}{\cos x} + \overset{f}{(x^3 - 2x + 1)} \cdot \overset{g'}{(-\sin x)}$

$f'(x) = (3x^2 - 2) \cdot \cos x - (x^3 - 2x + 1) \cdot \sin x.$

9.) $f(x) = 3^x + \ln x - \frac{1}{x}$ $\quad x^{-1}$

$f'(x) = 3^x \ln 3 + \frac{1}{x} - (-1)\,x^{-2} = \boxed{3^x \ln 3 + \frac{1}{x} + \frac{1}{x^2}}$

10.) $f(x) = 2^x + \log_2 x$

$f'(x) = \boxed{2^x \cdot \ln 2 + \frac{1}{x \cdot \ln 2}}$

11.) $f(x) = \underbrace{x^2 \cdot e^x} + \underbrace{2x \cdot \ln x}$

$f'(x) = \underbrace{2x \cdot e^x + x^2 e^x} + \underbrace{2 \cdot \ln x + \cancel{2x}\,\frac{1}{\cancel{x}}} =$

$= \boxed{2x \cdot e^x + x^2 \cdot e^x + 2\ln x + 2.}$

12.) $f(x) = \sqrt{x} \cdot \sin x - \log_3 5 = x^{1/2} \cdot \sin x - \log_3 5.$

$f'(x) = \frac{1}{2} \cdot x^{-1/2} \cdot \sin x + \sqrt{x} \cdot \cos x - 0$

$\quad f' \quad g \quad + \quad f \quad g'$

$= \frac{1}{2\sqrt{x}} \sin x + \sqrt{x} \cdot \cos x = \frac{\sin x + 2\overbrace{\sqrt{x}\sqrt{x}}^{x} \cdot \cos x}{2\sqrt{x}}$

$= \boxed{\frac{\sin x + 2x\cos x}{2\sqrt{x}}}$

ZATIKETA

13) $f(x) = \frac{4x}{x+1} = \frac{F(x)}{G(x)}$ $\qquad f'(x) = \frac{F'G - FG'}{G^2}$

$$f'(x) = \frac{4\cdot(x+1) - 4x\cdot 1}{(x+1)^2} = \frac{\cancel{4x}+4-\cancel{4x}}{(x+1)^2} = \frac{4}{(x+1)^2}$$

14.) $f(x) = \frac{x^2-1}{2x+2} \longrightarrow f'(x) = \frac{2x(2x+2)-(x^2-1)\cdot 2}{(2x+2)^2} \dots$

$\boxed{\text{Erratago}}$!! Faktorizatu eta sinplifikatu.

$$f(x) = \frac{x^2-1}{2x+2} = \frac{\cancel{(x+1)}(x-1)}{2\cancel{(x+1)}} = \frac{x-1}{2} = \frac{1}{2}(x-1)$$

$$\boxed{f'(x) = \frac{1}{2}}$$

15.) $f(x) = \frac{x+1}{x-2} \longrightarrow f'(x) = \frac{1\cdot(x-2) - (x+1)\cdot 1}{(x-2)^2} = \frac{\cancel{x}-2-\cancel{x}-1}{(x-2)^2}$

$$\boxed{f'(x) = \frac{-3}{(x-2)^2}}$$

16.) $f(x) = \frac{\ln x}{x} \longrightarrow f'(x) = \frac{\frac{1}{\cancel{x}}\cdot\cancel{x} - \ln x\cdot 1}{x^2} = \boxed{\frac{1-\ln x}{x^2}}$

17.) $f(x) = \frac{e^x+e^{-x}}{2} = \frac{1}{2}(e^x + e^{-x}) \longrightarrow$ katearen erregela.

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

18.) $f(x) = \frac{1}{x^2+1} \longrightarrow f'(x) = \frac{0\cdot(x^2+1) - 1\cdot 2x}{(x^2+1)^2} = \boxed{\frac{-2x}{(x^2+1)^2}}$

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

$$= \frac{3x^3+6x^2-x^3}{(x+2)^2} = \boxed{\frac{2x^3+6x^2}{(x+2)^2}}$$

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

$= \dfrac{\cancel{6x}+4-\cancel{6x}+3}{(3x+2)^2} = \boxed{\dfrac{7}{(3x+2)^2}}$

21.) $f(x) = \dfrac{x^2}{x^2-1} \longrightarrow f'(x) = \dfrac{2x(x^2-1)-x^2(2x)}{(x^2-1)^2} =$

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

22.) $f(x) = \dfrac{\sqrt{x}}{x+2} \longrightarrow f' = \dfrac{\frac{1}{2\sqrt{x}}(x+2) - \sqrt{x}\cdot 1}{(x+2)^2} =$

$= \dfrac{\dfrac{x+2}{2\sqrt{x}} - \dfrac{\sqrt{x}\cdot 2\sqrt{x}}{2\sqrt{x}}}{(x+2)^2} = \dfrac{\dfrac{x+2-2x}{2\sqrt{x}}}{(x+2)^2} = \boxed{\dfrac{2-x}{(x+2)^2\cdot 2\sqrt{x}}}$

x

23.) $f(x) = (x^2-1)\cdot\sqrt{x}$

Produk → $f'(x) = 2x\cdot\sqrt{x} + (x^2-1)\cdot\dfrac{1}{2\sqrt{x}} = \dfrac{2x\sqrt{x}\cdot 2\sqrt{x}}{2\sqrt{x}} + \dfrac{x^2-1}{2\sqrt{x}} =$

$= \dfrac{4x^2+x^2-1}{2\sqrt{x}} = \boxed{\dfrac{5x^2-1}{2\sqrt{x}}}$

24.) $f(x) = 3\arcsin x \longrightarrow f'(x) = \dfrac{3}{\sqrt{1-x^2}}$

25.) $f(x) = 2\cdot\arccos x + e^x \longrightarrow f'(x) = \dfrac{-2}{\sqrt{1-x^2}} + e^x$

26.) $y = 5\,\mathrm{arctg}\,x \longrightarrow f'(x) = \dfrac{5}{1+x^2}$

27.) $y = \dfrac{x\cdot e^x - \ln x}{2} \longrightarrow f'(x) = \dfrac{1}{2}\cdot\left(1\cdot e^x + x\cdot e^x - \dfrac{1}{x}\right) = \boxed{\dfrac{xe^x + x^2e^x - 1}{2x}}$

28) $f(x) = 3^x \cdot \sin x - \log_2 x$

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

KATEAREN ERREGELA : Fn KONPOSATUAK

13. orrialdea

1.) $f(x) = (x^2+5)^6$

$f'(x) = 6 \cdot (x^2+5)^5 \cdot (x^2+5)' = 6(x^2+5)^5 \cdot 2x = \boxed{12x(x^2+5)^5}$

2.) $f(x) = \sin(x^2-1)$

$f'(x) = \cos(x^2-1) \cdot (x^2-1)' = \boxed{2x \cdot \cos(x^2-1)}$

3.) $f(x) = \cos(\ln x)$

$f'(x) = -\sin(\ln x) \cdot (\ln x)' = \boxed{-\dfrac{\sin(\ln x)}{x}}$

4.) $f(x) = tg(2x-3x^2)$

$f'(x) = [1 + tg^2(2x-3x^2)] \cdot (2x-3x^2)'$

$= \boxed{(-6x+2) \cdot [1 + tg^2(2x-3x^2)]}$

5.) $f(x) = e^{3x^2+1}$

$f'(x) = e^{3x^2+1} \cdot (3x^2+1)' = \boxed{6x \cdot e^{3x^2+1}}$

6.) $f(x) = 2^{4x+1}$

$f'(x) = 2^{4x+1} \ln 2 \cdot (4x+1)' = 2^{4x+1} \cdot \ln 2 \cdot 4$

$= \boxed{4 \cdot \ln 2 \cdot 2^{4x+1}}$

7.) $f(x) = \cos^2 x$

$$f'(x) = 2\cdot\cos x\cdot(\cos x)' = 2\cos x\cdot(-\sin x) =$$
$$= -2\cos x\cdot\sin x = \boxed{-\sin(2x)}$$

$\boxed{\sin 2x = 2\cdot\sin x\cdot\cos x}$

8.) $f(x) = e^{3x}$

$$f'(x) = e^{3x}\cdot(3x)' = \boxed{3\cdot e^{3x}}$$

9.) $f(x) = \ln(3x^2-6)$

$$f'(x) = \frac{1}{3x^2-6}\cdot(3x^2-6)' = \frac{6x}{3x^2-6} = \frac{6x}{3(x^2-2)} = \boxed{\frac{2x}{x^2-2}}$$

10.) $f(x) = \ln\left(\frac{3x^2-1}{2}\right) = \ln(3x^2-1) - \ln 2.$

LOGARIT. PROP !! $\boxed{\ln\frac{F(x)}{G(x)} = \ln F(x) - \ln G(x)}$

$$f'(x) = \frac{1}{3x^2-1}\cdot(3x^2-1)' - 0 = \boxed{\frac{6x}{3x^2-1}}$$

11.) $f(x) = \operatorname{arctg}(3x^2+2x)$

$$f'(x) = \frac{1}{1+(3x^2+2x)^2}\cdot(3x^2+2x)' = \frac{6x+2}{1+(3x^2+2x)^2}$$
$$= \boxed{\frac{6x+2}{9x^4+12x^3+4x^2+1}}$$

12.) $f(x) = \arcsin(x^2)$

$$f'(x) = \frac{1}{\sqrt{1-(x^2)^2}}\cdot(x^2)' = \boxed{\frac{2x}{\sqrt{1-x^4}}}$$

13.) $f(x) = \arccos(x^3-1)$

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

$$= \boxed{\frac{-3x^2}{\sqrt{x^6+2x^3}}}$$

18) $f(x) = \left(\frac{x^2-1}{x+2}\right)^2$

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

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

19.) $f(x) = \sqrt{x^2-4x} = (x^2-4x)^{1/2}$

$$f'(x) = \frac{1}{2}(x^2-4x)^{\frac{1}{2}-1} \cdot (x^2-4x)' = \frac{1}{2\sqrt{x^2-4x}} \cdot 2x-4 =$$

$$= \boxed{\frac{x-2}{\sqrt{x^2-4x}}}$$

20.) $f(x) = \frac{x+1}{(x-2)^2}$

$$f'(x) = \frac{1\cdot(x-2)^2 - 2(x-2)\cdot(x+1)}{(x-2)^4} =$$

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

21) $f(x) = \frac{(2x+1)^2}{x-1}$

$$f'(x) = \frac{\underbrace{2(2x+1)\cdot(2x+1)'}_{f'} \cdot \underbrace{(x-1)}_{g} - \underbrace{(2x+1)^2}_{f} \cdot \underbrace{1}_{g'}}{(x-1)^2} =$$

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

$$= \frac{8x^2-4x-4-4x^2-4x-1}{(x-1)^2} = \boxed{\frac{4x^2-8x-5}{(x-1)^2}}$$

14.) $f(x) = \sin(3x^2-1)^2$

$f'(x) = \cos(3x^2-1)^2 \cdot \left((3x^2-1)^2\right)'$

$= \cos(3x^2-1)^2 \cdot 2\cdot(3x^2-1)\cdot(3x^2-1)'$

$= \cos(3x^2-1)^2 \cdot 2\cdot(3x^2-1)\cdot 6x$

$= 12x(3x^2-1)\cdot\cos(3x^2-1)^2$

15.) $f(x) = \sin^2(3x^2-1) = \left[\sin(3x^2-1)\right]^2$

$f'(x) = 2\cdot\sin(3x^2-1)\cdot\left(\sin(3x^2-1)\right)' =$

$= 2\cdot\sin(3x^2-1)\cdot\cos(3x^2-1)\cdot(3x^2-1)'$

$= \underbrace{2\cdot\sin(3x^2-1)\cdot\cos(3x^2-1)}\cdot 6x$

$\boxed{\sin 2x = 2\sin x\cdot\cos x}$

$= 6x\cdot\sin 2(3x^2-1)$

$= \boxed{6x\cdot\sin(6x^2-2)}$

16.) $f(x) = 3^{\cos x}$

$f'(x) = 3^{\cos x}\cdot\ln 3\cdot(\cos x)' = \ln 3\cdot(-\sin x)\,3^{\cos x}$

17.) $f(x) = \ln\left(\frac{x+1}{x-2}\right)$ LOG PROPIETÀ!! $\log\frac{F(x)}{G(x)} = \log F(x) - \log G(x)$

$f(x) = \ln(x+1) - \ln(x-2)$

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

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

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

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

$$= \frac{6\cdot(6x^2+3x-2x-1) - 2(9x^2-6x+1)}{(2x+1)^2} =$$

$$= \frac{36x^2+18x-\cancel{12x}-6-18x^2+\cancel{12x}-2}{(2x+1)^2} =$$

$$= \boxed{\frac{18x^2+18x-8}{(2x+1)^2}}$$

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

$$f'(x) = \frac{e^x(x-1)^2 - e^x\cdot 2(x-1)\cdot 1}{(x-1)^4} =$$

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

$$= \frac{e^x\cancel{(x-1)}(x-3)}{(x-1)^4} =$$

$$= \boxed{\frac{e^x(x-3)}{(x-1)^3}}$$

x^2-4x+3

$$\begin{array}{c|ccc} & 1 & -4 & 3 \\ 1 & & 1 & -3 \\ \hline & 1 & -3 & 0 \end{array}$$

14. orrialdea

1.) $y = \frac{x^3}{3} - \frac{x^2}{4} + \frac{2}{3} \longrightarrow y' = \frac{3x^2}{3} - \frac{2x}{4} = \boxed{x^2 - \frac{1}{2}x}$

2.) $y = \frac{x^5}{3} - \frac{2}{x^2} + 3 \longrightarrow y' = \frac{5x^4}{3} - 2(-2)x^{-3} = \boxed{\frac{5x^4}{3} + \frac{4}{x^3}}$

3.) $y = \frac{x^2-2x+1}{5} \longrightarrow y' = \boxed{\frac{2x-2}{5}}$

4.) $y = (3x-2)\cdot e^x \longrightarrow y' = 3\,e^x + (3x-2)\cdot e^x = \boxed{(3x+1)\cdot e^x}$

5.) $y = \sqrt{x} - \frac{2}{x^3} + \sqrt{5}$
$= x^{1/2} - 2x^{-3} + \sqrt{5}$
$\longrightarrow y' = \frac{1}{2}x^{\frac{1}{2}-\frac{1}{2}} - 2(-3)\cdot x^{-4} =$
$= \frac{1}{2\sqrt{x}}\frac{\sqrt{x}}{\sqrt{x}} + \frac{6}{x^4} = \boxed{\frac{\sqrt{x}}{2x} + \frac{6}{x^4}}$

6.) $y = \frac{1}{x} - \frac{\sqrt[3]{x}}{3} + 2x^2 = x^{-1} - \frac{x^{1/3}}{3} + 2x^2$

$y' = (-1)\cdot x^{-2} - \frac{1}{3}\,\frac{x^{1/3-1}}{3} + 2\cdot 2\cdot x = -\frac{1}{x^2} - \frac{1}{9\sqrt[3]{x^2}} + 4x$

$\frac{1}{9\sqrt[3]{x^2}}\cdot\frac{\sqrt[3]{x}}{\sqrt[3]{x}} = \frac{\sqrt[3]{x}}{9x}$

$= -\frac{1}{x^2} - \frac{1}{9x} + 4x =$

$= \boxed{\frac{-9 - x + 36x^3}{9x^2}}$

7.) $y = \frac{\sqrt[3]{x}}{x^2} - \frac{x^2-1}{3} = x^{1/3-2} - \frac{x^2-1}{3} = x^{-5/3} - \frac{x^2-1}{3} =$

$y' = -\frac{5}{3}x^{-5/3-1} - \frac{1}{3}2x = -\frac{5}{3}x^{-8/3} - \frac{2}{3}x =$

$= \frac{-5\sqrt[3]{x}}{3x} - \frac{2}{3}x =$

$= \boxed{\frac{-5\sqrt[3]{x} - 2x^2}{3}}$

$x^{-8/3} = \frac{1}{\sqrt[3]{x^8}} = \frac{1}{x^2\sqrt[3]{x^2}}\cdot\frac{\sqrt[3]{x}}{\sqrt[3]{x}} =$
$= \frac{\sqrt[3]{x}}{x^3}$

8). $y = \dfrac{x^3 - 3x^4 + 2x + 1}{x} = x^2 - 3x^3 + 2 + x^{-1}$

$y' = 2x - 9x^2 - 1x^{-2} = \boxed{-9x^2 + 2x - \dfrac{1}{x^2}}$

9.) $y = \dfrac{3}{2x^2} - \dfrac{2x^2}{3} + \ln 5 = \dfrac{3}{2}x^{-2} - \dfrac{2}{3}x^2 + \ln 5$

$y' = \cancel{\dfrac{3}{2}} \cdot (-\cancel{2}) x^{-3} - \dfrac{2}{3} \cdot 2 \cdot x + 0 = \dfrac{-3}{x^3} - \dfrac{4x}{3} = \boxed{\dfrac{-9 - 4x^4}{3x^3}}$

10.) $y = \sqrt{\dfrac{2}{x^3}} - \dfrac{x^2}{3} + \underset{-5/2}{\sqrt{2}} = \sqrt{2} \cdot x^{-3/2} - \dfrac{1}{3}x^2 + \sqrt{2}$

$y' = \sqrt{2} \cdot \dfrac{-3}{2} \cdot x^{-3/2 - 1} - \dfrac{1}{3} \cdot 2x + 0 = \dfrac{-3\sqrt{2}}{2} \cdot \dfrac{1}{\sqrt{x^5}} - \dfrac{2x}{3} = \boxed{\dfrac{-3\sqrt{2x}}{x^3} - \dfrac{2x}{3}}$

11.) $y = \dfrac{2\sqrt{3}}{4} + \dfrac{3\ln x}{2} \rightarrow \boxed{y' = \dfrac{3}{2x}}$ $\quad \dfrac{1}{\sqrt{x^5}} = \dfrac{1}{x^2\sqrt{x}} \cdot \dfrac{\sqrt{x}}{\sqrt{x}} = \dfrac{\sqrt{x}}{x^3}$

12.) $y = \sin x \cdot \cos x \longrightarrow y' = \cos x \cdot \cos x + \sin x(-\sin x)$

$= \boxed{\cos^2 x - \sin^2 x = \cos(2x)}$!!!

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

$y' = \dfrac{e^x(x^2 - 1) - e^x \cdot 2x}{(x^2 - 1)^2} = \dfrac{e^x(x^2 - 2x - 1)}{(x^2 - 1)^2}$

14.) $y = \dfrac{x^2 - 1}{2x + 1} \longrightarrow y' = \dfrac{2x(2x+1) - (x^2 - 1) \cdot 2}{(2x+1)^2} =$

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

14) $y = \dfrac{x^2 - 1}{2x + 1} \longrightarrow y' = \dfrac{2x(2x+1) - (x^2 - 1) \cdot 2}{(2x+1)^2} =$

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

15.) $y = (x^2-1)e^x - \ln x$

$y' = 2x\cdot e^x + (x^2-1)e^x - \frac{1}{x} = \boxed{e^x(x^2+2x-1) - \frac{1}{x}}$

16.) $y = 2^x - 3\operatorname{tg} x \longrightarrow y' = \boxed{2^x \ln 2 - 3(1+\operatorname{tg}^2 x)}$

17.) $y = x^3\cdot e^x + x^2 \sin x \longrightarrow$

$y' = \boxed{3x^2 e^x + x^3\cdot e^x + 2x\cdot \sin x + x^2 \cos x}$

18.) $y = \frac{x-1}{3x-2} \longrightarrow y' = \frac{1(3x-2)-(x-1)\cdot 3}{(3x-2)^2} =$

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

19) $y = \frac{\sqrt{x}}{\sin x} \longrightarrow y' = \frac{\frac{1}{2}x^{-1/2}\cdot \sin x - \sqrt{x}\cdot\cos x}{\sin^2 x} =$

$= \frac{\frac{\sin x}{2\sqrt{x}} - \sqrt{x}\cos x}{\sin^2 x} = \frac{\frac{\sin x - \sqrt{x}\cos x(2\sqrt{x})}{2\sqrt{x}}}{\sin^2 x} =$

$= \boxed{\frac{\sin x - 2x\cos x}{2\sqrt{x}\cdot \sin^2 x}}$

20.) $y = (x^2-1)^4 \longrightarrow y' = 4(x^2-1)^3 2x = \boxed{8x(x^2-1)^3}$

21.) $y = \left(\frac{x-1}{x+2}\right)^3 \rightarrow y' = 3\left(\frac{x-1}{x+2}\right)^2\cdot\left(\frac{x-1}{x+2}\right)' =$

$y' = 3\left(\frac{x-1}{x+2}\right)^2 \cdot \frac{1(x+2)-(x-1)\cdot 1}{(x+2)^2} = \frac{3(x-1)^2}{(x+2)^2}\,\frac{3}{(x+2)^2} =$

$= \boxed{\frac{9(x-1)^2}{(x+2)^4}}$

22.) $y = \frac{2x-1}{(x+1)^2} \longrightarrow y' = \frac{2(x+1)^2 - (2x-1)\cdot 2(x+1)}{(x+1)^4} =$

$= \frac{\cancel{(x+1)}\left[2(x+1) - (2x-1)\cdot 2\right]}{(x+1)^{\cancel{4}\,3}} = \frac{2x+2-4x+2}{(x+1)^3} =$

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

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

$y' = \frac{(x-1)^2\left[(x-1) - (x+1)\cdot 3\right]}{(x-1)^6} = \frac{(x-1)-3x-3}{(x-1)^4} = \boxed{\frac{-2x-4}{(x-1)^4}}$

24.) $y = \ln\left(\frac{x-1}{x+4}\right) \quad \boxed{y = \ln(x-1) - \ln(x+4)}$

$y' = \frac{1}{x-1} - \frac{1}{x+4} = \frac{(x+4)-(x-1)}{(x-1)(x+4)} = \frac{5}{(x-1)(x+4)}$

25.) $y = \cos^2(3x-2) = \boxed{\left[\cos(3x-2)\right]^2}$

$y' = 2\cdot\cos(3x-2)\cdot\left(\cos(3x-2)\right)' =$

$= 2\cdot\cos(3x-2)\cdot\left(-\sin(3x-2)\right)\cdot(3x-2)' =$

$= -\underbrace{2\sin(3x-2)\cdot\cos(3x-2)}\cdot(3x-2)$

$= -(3x-2)\sin(6x-4)$

$\boxed{\sin 2x = 2\cdot\sin x\cdot\cos x}$

26.) $y = \sqrt{\sin x} = (\sin x)^{1/2}$

$$y' = \frac{1}{2}(\sin x)^{1/2-1} \cdot (\sin x)' = \frac{1}{2}(\sin x)^{-1/2} \cos x =$$

$$= \frac{1}{2}\frac{\cos x}{\sqrt{\sin x}} \cdot \frac{\sqrt{\sin x}}{\sqrt{\sin x}} = \boxed{\frac{\sqrt{\sin x} \cdot \cos x}{2 \sin x}}$$

27.) $y = \ln(\sin x^2)$

$$y' = \frac{1}{\sin x^2} \cdot (\sin x^2)' = \frac{1}{\sin x^2} \cos x^2 \cdot (x^2)' =$$

$$= \frac{\cos x^2}{\sin x^2} 2x = \boxed{\frac{2x}{\operatorname{tg} x^2}}$$

28.) $y = e^{4x-1} \sin(3x^2)$ $\quad f'g + fg'$

$$y' = (e^{4x-1})' \cdot \sin(3x^2) + e^{4x-1} \cdot (\sin 3x^2)' =$$

$$= \underbrace{e^{4x-1} \cdot 4}_{f'} \cdot \underbrace{\sin(3x^2)}_{g} + \underbrace{e^{4x-1}}_{f} \underbrace{\cos 3x^2 \cdot 6x}_{g'} =$$

$$= \boxed{e^{4x-1}\left[4 \cdot \sin(3x^2) + 6x \cdot \cos(3x^2)\right]}$$

29.) $y = 2^{4x^2-1} \ln(8x)$

$$y' = (2^{4x^2-1})' \cdot \ln(8x) + 2^{4x^2-1} \cdot (\ln(8x))'$$

$$= \underbrace{2^{4x^2-1} \cdot \ln 2 \cdot 8x}_{f'} \cdot \underbrace{\ln(8x)}_{g} + \underbrace{2^{4x^2-1}}_{f} \underbrace{\frac{1}{\cancel{8}x} \cdot \cancel{8}}_{g'} =$$

$$= \boxed{\ln 2 \cdot 8x \cdot 2^{4x^2-1} \cdot \ln(8x) + \frac{2^{4x^2-1}}{x}}$$

30.) $y = \dfrac{(2x+3)^2}{1-x} \longrightarrow y' = \dfrac{2(2x+3)(1-x) - (2x+3)^2(-1)}{(1-x)^2} =$

$$y' = \frac{2(2x-2x^2+3-3x) - (4x^2+12x+9)}{(1-x)^2} =$$

$$= \frac{4x-4x^2+6-6x-4x^2-12x-9}{(1-x)^2} = \boxed{\frac{-8x^2-14x-3}{(1-x)^2}}$$

31.) $y = tg\left(\dfrac{2}{x-3}\right) = tg\left[2\cdot(x-3)^{-1}\right]$

$$y' = \left[1+tg^2\left(\frac{2}{x-3}\right)\right]\cdot\left(2(x-3)^{-1}\right)' =$$

$$= \left[1+tg^2\left(\frac{2}{x-3}\right)\right]\cdot 2\cdot(-1)\cdot(x-3)^{-2} =$$

$$= \boxed{\frac{-2}{(x-3)^2}\left[1+tg^2\frac{2}{x-3}\right]}$$

32.) $y = \dfrac{e^{5x+1}}{x+2}$

$$y' = \frac{(e^{5x+1})'\cdot(x+2) - e^{5x+1}(x+2)'}{(x+2)^2} =$$

$$= \frac{e^{5x+1}\cdot 5\cdot(x+2) - e^{5x+1}\cdot 1}{(x+2)^2} = \boxed{\frac{e^{5x+1}(5x+9)}{(x+2)^2}}$$

33.) $y = \dfrac{ln^2 x}{x} = \dfrac{(ln x)^2}{x}$

$$y' = \frac{2 ln x (ln x)'\cdot x - (ln x)^2\cdot x'}{x^2}$$

$$y' = \frac{2 ln x\cdot\frac{1}{\cancel{x}}\cdot\cancel{x} - (ln x)^2}{x^2} = \frac{2 ln x - (ln x)^2}{x^2} = \boxed{\frac{ln x(2-ln x)}{x^2}}$$

34.) $y = \dfrac{x \cdot e^x}{x+2}$

$$y' = \frac{(x \cdot e^x)' \cdot (x+2) - x \cdot e^x \cdot (x+2)'}{(x+2)^2} =$$

$$= \frac{(\overset{f'}{1} \cdot \overset{g}{e^x} + \overset{f}{x} \cdot \overset{g'}{e^x}) \cdot (x+2) - x \cdot e^x \cdot 1}{(x+2)^2} =$$

$$= \frac{\cancel{x \cdot e^x} + 2 \cdot e^x + x^2 e^x + 2x \cdot e^x - \cancel{x e^x}}{(x+2)^2}$$

$$= \frac{e^x (x^2 + 2x + 2)}{(x+2)^2}$$

35.) $y = \dfrac{\sqrt{x-1}}{3x+4}$

$$y' = \frac{\frac{1}{2\sqrt{x-1}} (3x+4) - \sqrt{x-1} \cdot 3}{(3x+4)^2} = \frac{\dfrac{3x+4 - \overbrace{\sqrt{x-1} \cdot 3 \cdot (2 \cdot \sqrt{x-1})}^{(x-1) \cdot 6}}{2\sqrt{x-1}}}{(3x+4)^2} =$$

$$= \frac{3x+4 - 6(x-1)}{2\sqrt{x-1} \cdot (3x+4)^2} = \boxed{\frac{-3x+10}{2\sqrt{x-1}\, (3x+4)^2}}$$

36.) $y = \sqrt{\dfrac{3x+1}{x+2}} = \left(\dfrac{3x+1}{x+2}\right)^{1/2}$

$$y' = \frac{1}{2} \sqrt{\frac{3x+1}{x+2}} \cdot \left(\frac{3x+1}{x+2}\right)' = \frac{1}{2} \cdot \frac{3x+1}{x+2} \cdot \frac{3(x+2) - (3x+1) \cdot 1}{(x+2)^2} =$$

$$= \frac{3x+1}{2(x+2)} \cdot \frac{\cancel{3x} + 6 - \cancel{3x} - 1}{(x+2)^2} = \boxed{\frac{5(3x+1)}{2(x+2)^3}}$$

37.) $y = \operatorname{arctg}(x^2+2)$

$$y' = \frac{1}{1+(x^2+2)^2} \cdot (x^2+2)' = \frac{2x}{1+x^4+4x^2+4} =$$

$$= \frac{2x}{x^4+4x^2+5}$$

38.) $y = \sqrt{\operatorname{arctg} x} = (\operatorname{arctg} x)^{1/2}$

$$y' = \frac{1}{2}(\operatorname{arctg} x)^{-1/2} \cdot (\operatorname{arctg} x)' = \frac{1}{2\sqrt{\operatorname{arctg} x}} \frac{1}{(1+x^2)}$$

39.) $y = \dfrac{3 \cdot \arcsin(2x-1)}{4}$

$$y' = \frac{3}{4} \cdot \frac{1}{\sqrt{1-(2x-1)^2}} (2x-1)' = \frac{3 \cdot 2}{4\sqrt{1-(2x-1)^2}} =$$

$$= \frac{3}{2\sqrt{-4x^2+4x}}$$

40.) $f(x) = \arccos(\sqrt{x})$

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

$$= \frac{-1}{2\sqrt{x(1-x)}} = \frac{-1}{2\sqrt{x-x^2}}$$