- $f(x) = c \implies f'(x) = 0$
- $f(x) = ax \implies f'(x) = a$
- $f(x) = ax + b \implies f'(x) = a$
- $f(x) = ax^2 + bx + c \implies f'(x) = 2ax + b$
- $f(x) = ax^3 \implies f'(x) = 3ax^2$
- $f(x) = ax^n \implies f'(x) = nax^{n-1}, n \in \mathbb{N}$
- $f(x) = f_1(x) + f_2(x) \implies f'(x) = f_1'(x) + f_2'(x)$
- $f(x) = f_1(x) \cdot f_2(x) \implies f'(x) = f_1'(x) \cdot f_2(x) + f_1(x) \cdot f_2'(x)$
- $f(x) = f_1(x) \cdot f_2(x) \cdot f_3'(x) \implies$
  $f'(x) = f_1'(x) \cdot f_2(x) \cdot f_3(x) + f_1(x) \cdot f_2'(x) \cdot f_3(x) + f_1(x) \cdot f_2(x) \cdot f_3'(x)$
- $f(x) = \dfrac{f_1(x)}{f_2(x)} \implies f'(x) = \dfrac{f_1'(x) \cdot f_2'(x) - f_1(x) \cdot f_2'(x)}{f_2(x)^2}$
- $f(x) = (f_1(x))^n \implies f'(x) = n \cdot (f_1(x))^{n-1} \cdot f'(x), n \in \mathbb{Q}$
- $f(x) = \sqrt{x} \implies f'(x) = \dfrac{1}{2\sqrt{x}}$
- $f(x) = \sqrt[3]{x} \implies f'(x) = \dfrac{1}{3\sqrt[3]{x^2}}$
- $f(x) = \sqrt[n]{x} \implies f'(x) = \dfrac{1}{n\sqrt[n]{x^{n-1}}}$
- $f(x) = \sqrt[n]{f_1(x)} \implies f'(x) = \dfrac{1}{n\sqrt[n]{f_1(x)^{n-1}}} f_1'(x)$

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

Solución:
$f'(x) = \dfrac{3x^2}{2} - \dfrac{4x^3}{3} + 8$

2. $f(x) = \dfrac{3}{x^2}$

Solución:
$f'(x) = \dfrac{-6}{x^3}$

3. $f(x) = (3 + 2x + 5x^2)^2$

Solución:
$f'(x) = 2(3 + 2x + 5x^2)(10x + 2) = (10x^2 + 4x + 6)(10x + 2)$

4. $f(x) = \dfrac{3x}{x^2 - 8}$

Solución:
$f'(x) = \dfrac{3(x^2 - 8) - 3x \cdot 2x}{(x^2 - 8)^2} = \dfrac{-3x^2 - 24}{(x^2 - 8)^2}$

5. $f(x) = \sqrt{3 - 2x}$

Solución:
$f'(x) = \dfrac{1}{2\sqrt{3 - 2x}} \cdot (-2) = -\dfrac{1}{2\sqrt{3 - 2x}}$

6. $f(x) = \dfrac{10}{(x - 1)^4}$

Solución:
$f(x) = 10(x - 1)^{-4}$
$f'(x) = -40(x - 1)^{-5} = -\dfrac{40}{(x - 1)^5}$

7. $f(x) = \sqrt[3]{x^3 - 2}$

Solución:
$f'(x) = \dfrac{1}{3\sqrt[3]{(x^3 - 2)^2}} \cdot 3x^2 = \dfrac{x^2}{\sqrt[3]{(x^3 - 2)^2}}$

8. $f(x) = \sqrt{x} \cdot (x + 1)^3$

Solución:
$f'(x) = \dfrac{1}{2\sqrt{x}} \cdot (x + 1)^3 + \sqrt{x} \cdot 3(x + 1)^2$

9. $f(x) = \dfrac{\sqrt[3]{x^2}}{x - 1}$

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

10. $f(x) = \sqrt[4]{(x + 1)^3}$

Solución:
$f'(x) = \dfrac{1}{4\sqrt[4]{(x+1)^6}} \cdot 3(x+1)^2 = \dfrac{3}{4\sqrt[4]{x+1}}$

- $f(x) = a \cdot f_1(x) \implies f'(x) = a \cdot f_1'(x)$
- $f(x) = f_1(f_2(x)) \implies f'(x) = f_1'(f_2(x)) \cdot f_2'(x)$
- $f(x) = f_1(f_2(f_3(x))) \implies f'(x) = f_1'(f_2(f_3(x))) \cdot f_2'(f_3(x)) \cdot f_3'(x)$
- $f(x) = \ln x \implies f'(x) = \dfrac{1}{x}$
- $f(x) = \ln f(x) \implies f'(x) = \dfrac{1}{f(x)} \cdot f'(x)$
- $f(x) = \log x \implies f'(x) = \dfrac{1}{x} \log e,$ $\log e = 0,4343$
- $f(x) = \log f(x) \implies f'(x) = \dfrac{1}{f(x)} \cdot \log e \cdot f'(x)$
- $f(x) = \log_b x \implies f'(x) = \dfrac{1}{x} \log_b e,$ $\log e = 0,4343$
- $f(x) = \log_b f(x) \implies f'(x) = \dfrac{1}{f(x)} \cdot \log_b e \cdot f'(x)$
- $f(x) = e^x \implies f'(x) = e^x$
- $f(x) = e^{f(x)} \implies f'(x) = e^{f(x)} \cdot f'(x)$
-
- $f(x) = 10^x \implies f'(x) = 10^x \cdot \ln 10$
- $f(x) = 10^{f(x)} \implies f'(x) = 10^{f(x)} \cdot \ln 10 \cdot f'(x)$
- $f(x) = a^x \implies f'(x) = a^x \cdot \ln a$
- $f(x) = a^{f(x)} \implies f'(x) = a^{f(x)} \cdot \ln a \cdot f'(x)$
- $f(x) = f_1(x)^{f_2(x)} \implies$
  $f'(x) = f_2(x) \cdot f_1(x)^{f_2(x)-1} \cdot f_1'(x) + f_1(x)^{f_2(x)} \cdot \ln f_1(x) \cdot f_2'(x)$

11. $f(x) = \log\left(x^3 + \dfrac{1}{x}\right)$

Solución:
$f'(x) = \dfrac{1}{x^3 + \frac{1}{x}} \cdot \log e \left(3x^2 - \dfrac{1}{x^2}\right)$

12. $f(x) = e^{-\frac{x^2}{4}}$

Solución:
$f'(x) = e^{-\frac{x^2}{4}} \cdot \dfrac{-8x}{16} = e^{-\frac{x^2}{4}} \cdot \dfrac{-x}{2}$

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

Solución:
$f'(x) = e^{x^2} \cdot 2x \cdot (x^3+3) + 3x^2 \cdot e^{x^2}$

14. $f(x) = \ln \sqrt[3]{x^5}$

Solución:
$f(x) = \ln \sqrt[3]{x^5} = \ln x^{\frac{5}{3}} = \dfrac{5}{3} \ln x \; f'(x) = \dfrac{5}{3} \cdot \dfrac{1}{x}$

15. $f(x) = \log^2(x^2+3)$

Solución:
$f'(x) = 2\log(x^2+3) \cdot \dfrac{1}{x^2+3} \cdot \log e \cdot 2x$

16. $f(x) = (\sin x)^x$

Solución:
$f'(x) = x \cdot (\sin x)^{x-1} \cdot \cos x + (\sin x)^x \cdot \ln(\sin x)$

17. $f(x) = \log_2 \dfrac{x^4}{x^2+1}$

Solución:
$f(x) = \log_2 x^4 - \log_2(x^2+1) = 4\log_2 x - \log_2(x^2+1)$
$f'(x) = 4\dfrac{1}{x} \log_2 e - \dfrac{1}{x^2+1} \log_2 e \cdot 2x = \left(\dfrac{4}{x} - \dfrac{2x}{x^2+1}\right) \log_2 e$

18. $f(x) = \ln^3(x^2+x+1)$

Solución:
$f'(x) = 3(\ln^2(x^2+x+1))\dfrac{1}{x^2+x+1}(2x+1)$

19. $f(x) = \log_5(5-x)^6$

Solución:

$f(x) = 6\log_5(5-x)$

$f'(x) = 6\dfrac{1}{5-x}\cdot\log_5 e\cdot(-1) = -\dfrac{6}{5-x}\log_5 e$

- $f(x) = \sin x \implies f'(x) = \cos x$
- $f(x) = \sin f(x) \implies f'(x) = (\cos f(x))\cdot f'(x)$
- $f(x) = \cos x \implies f'(x) = -\sin x$
- $f(x) = \cos f(x) \implies f'(x) = (-\sin f(x))\cdot f'(x)$
- $f(x) = \operatorname{tg} x \implies f'(x) = 1+\operatorname{tg}^2 x = \dfrac{1}{\cos^2 x}$
- $f(x) = \operatorname{tg} f(x) \implies f'(x) = 1+\operatorname{tg}^2 f(x)\cdot f'(x) = \dfrac{1}{\cos^2 f(x)}f'(x)$
- $f(x) = \cot x \implies f'(x) = -1-\cot^2 x = -\dfrac{1}{\sin^2 x}$
- $f(x) = \cot f(x) \implies f'(x) = (-1-\cot^2 f(x))\cdot f'(x) = -\dfrac{1}{\sin^2 f(x)}\cdot f'(x)$
- $f(x) = \sec x = \dfrac{1}{\cos x} \implies f'(x) = \ldots$
- $f(x) = \operatorname{cosec} x = \dfrac{1}{\sin x} \implies f'(x) = \ldots$

20. $f(x) = \sin^3(-x)$

Solución:

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

21. $f(x) = \cos\sqrt[3]{x}$

Solución:

$f'(x) = \dfrac{-\sin\sqrt[3]{x}}{3\sqrt[3]{x^2}}$

22. $f(x) = 3^{\operatorname{tg}^2 x}$

Solución:

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

23. $f(x) = \log\cos^3 x^2$

Solución:

$f(x) = 3\log\cos x^2$

$$f'(x) = \frac{-6x \cdot \sin x^2}{\cos x^2} \cdot \log e$$

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

Solución:

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

- $f(x) = \arcsin x \implies f'(x) = \dfrac{1}{\sqrt{1-x^2}}$
- $f(x) = \arcsin f_1(x) \implies f'(x) = \dfrac{1}{\sqrt{1-f(x)^2}} \cdot f'(x)$
- $f(x) = \arccos x \implies f'(x) = -\dfrac{1}{\sqrt{1-x^2}}$
- $f(x) = \arccos f_1(x) \implies f'(x) = -\dfrac{1}{\sqrt{1-f(x)^2}} \cdot f'(x)$
- $f(x) = \arctan x \implies f'(x) = \dfrac{1}{1+x^2}$
- $f(x) = \arctan f_1(x) \implies f'(x) = \dfrac{1}{1+f(x)^2} \cdot f'(x)$
- $f(x) = x \implies f'(x) = -\dfrac{1}{1+x^2}$
- $f(x) = f_1(x) \implies f'(x) = -\dfrac{1}{1+f(x)^2} \cdot f'(x)$

25. $f(x) = \arctan \dfrac{5}{x}$

Solución:

$$f'(x) = \frac{1}{1+\frac{25}{x^2}} \cdot (-5) \cdot x^{-2} = -\frac{5}{x^2+25}$$

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

Solución:

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

27. $f(x) = \arctan(2\cos x)$

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

28. $f(x) = \sin x$. Calcula $f^{(32)}(x)$.

Solución:
$f'(x) = \cos x$

$f''(x) = -\sin x$

$f'''(x) = \cos x$

$f^{(4)}(x) = \sin x$

...

Temos que 32 é múltiplo de 4, logo irase repetindo o ciclo anterior e teremos que:

$f^{(32)}(x) = \sin x$

29. $f(x) = \cos x$. Calcula $f^{(101)}(x)$.

Solución:
$f'(x) = -\sin x$

$f''(x) = -\cos x$

$f'''(x) = \sin x$

$f^{(4)}(x) = \cos x$

...

Temos que 100 é múltiplo de 4, logo irase repetindo o ciclo anterior e teremos que:

$f^{(100)}(x) = \cos x$

$f^{(101)}(x) = -\sin x$

30. $f(x) = \dfrac{5}{x}$. Calcula $f'(x), f''(x), f'''(x), ..., f^{(n)}(x)$.

Solución:
$f'(x) = 5 \cdot (-1) \cdot x^{-2}$

$f''(x) = 5 \cdot 2 \cdot x^{-3}$

$f'''(x) = 5 \cdot (-6) \cdot x^{-4}$

$f^{(4)}(x) = 5 \cdot 24 \cdot x^{-5}$

$\dots$

$f^{(100)}(x) = 5 \cdot (-1)^n \cdot n! \cdot x^{-(n+1)}$