



Lernziel:

Sie verstehen die Differenzialrechnung und können weitere Funktionen (e, ln, sin und cos) ableiten.

1. Leiten Sie ab.

- a) $f(x) = \sin(7x) \rightarrow \dot{f}(x) = \cos(7x) * 7$
b) $f(x) = \cos(3x) \rightarrow \dot{f}(x) = -\sin(3x) * 3$
c) $f(x) = \tan(4x) \rightarrow \dot{f}(x) = \frac{1}{\cos^2 4x} * 4$
d) $f(x) = e^{8x} \rightarrow \dot{f}(x) = e^{8x} * 8$
e) $f(x) = \ln(6x) \rightarrow \dot{f}(x) = \frac{1}{6x} * 6 = \frac{1}{x}$
f) $f(x) = a^{4x} \rightarrow \dot{f}(x) = \ln(a) * a^{4x} * 4$
g) $f(x) = \sin(x^2) \rightarrow \dot{f}(x) = \cos(x^2) * 2x$
h) $f(x) = \cos(x^8) \rightarrow \dot{f}(x) = -\sin(x^8) * 8x^7$
i) $f(x) = \tan(x^3) \rightarrow \dot{f}(x) = \frac{1}{\cos^2 x^3} * 3x^2$
j) $f(x) = e^{x^9} \rightarrow \dot{f}(x) = e^{x^9} * 9x^8$
k) $f(x) = \ln(x^5) \rightarrow \dot{f}(x) = \frac{1}{x^5} * 5x^4 = \frac{5}{x}$
l) $f(x) = a^{x^7} \rightarrow \dot{f}(x) = \ln(a) * a^{x^7} * 7x^6$

2. Leiten Sie ab.

- a) $f(x) = \ln\left(\frac{x+1}{x-1}\right)$
 $\rightarrow \dot{f}(x) = \frac{x-1}{x+1} * \frac{(x-1)-(x+1)}{(x-1)^2} = \frac{1}{x+1} * \frac{x-1-(x+1)}{(x-1)} = \frac{1}{x+1} * \frac{0}{(x-1)} = 0$
- b) $f(x) = e^{x+1}$
 $\rightarrow \dot{f}(x) = e^{x+1}$
- c) $f(x) = e^x * \ln(x+2)$
 $\rightarrow \dot{f}(x) = e^x * \ln(x+2) + e^x * \frac{1}{x+2} = e^x \left(\ln(x+2) + \frac{1}{x+2} \right)$
- d) $f(x) = \ln(x^2 + 2x + 9)$
 $\rightarrow \dot{f}(x) = \frac{1}{x^2+2x+9} * (2x+2)$
- e) $f(x) = 5^{x^2+3x+2}$
 $\rightarrow \dot{f}(x) = \ln(5) * 5^{x^2+3x+2} * (2x+3)$
- f) $f(x) = \ln\left(\frac{x^2+4x+9}{x}\right)$
 $\rightarrow \dot{f}(x) = \frac{x}{x^2+4x+9} * \frac{(2x+4)*x-(x^2+4x+9)}{x^2} = \frac{1}{x^2+4x+9} * \frac{x^2-9}{x}$



g) $f(x) = \sin(3x^2 + 3) + \cos(x^3 + x)$
 $\rightarrow \dot{f}(x) = 6x \cos(3x^2 + 3) - (3x^2 + 1) \sin(x^3 + x)$

h) $f(x) = e^{x^3+3x}$
 $\rightarrow \dot{f}(x) = 3 * e^{x^3+3x} * (x^2 + 1)$

i) $f(x) = (e^{x^2+9})^3 * \ln\left(\frac{3}{x}\right)$
 $\rightarrow \dot{f}(x) = 3(e^{x^2+9})^2 e^{x^2+9} * 2x * \ln\left(\frac{3}{x}\right) - (e^{x^2+9})^3 * \frac{x}{3} * \frac{3}{x^2}$
 $= (e^{x^2+9})^3 * \left[6x \ln\left(\frac{3}{x}\right) - \frac{1}{x}\right]$

j) $f(x) = (\sin(x^3))^2$
 $\rightarrow \dot{f}(x) = 2 \sin(x^3) * \cos(x^3) * 3x^2 = 6x^2 * \sin(x^3) * \cos(x^3)$

k) $f(x) = \frac{\sin(3x)}{\cos(x^2+7)}$
 $\rightarrow \dot{f}(x) = \frac{3 \cos(3x) * \cos^2(x^2+7) + \sin(3x) * \sin(x^2+7) * 2x}{\cos^2(x^2+7)}$