

Lösungen zu den Übungen zur Quotientenregel

$$1. f(x) = \frac{2x}{x^2+4} \quad f'(x) = \frac{2 \cdot (x^2+4) - 2x \cdot 2x}{(x^2+4)^2} = \frac{2x^2+8-4x^2}{(x^2+4)^2} = \frac{-2x^2+8}{(x^2+4)^2}$$

$$2. f(x) = \frac{2x^3-8}{x^4+6} \quad f'(x) = \frac{6x^2 \cdot (x^4+6) - (2x^3-8) \cdot 4x^3}{(x^4+6)^2} = \frac{12x^6+36x^2 - (8x^6-32x^3)}{(x^4+6)^2} = \frac{12x^6+36x^2-8x^6+32x^3}{(x^4+6)^2}$$

$$= \frac{4x^6+32x^3+36x^2}{(x^4+6)^2}$$

$$3. f(x) = \frac{10-4x^2}{x^2+7} \quad f'(x) = \frac{-8x \cdot (x^2+7) - (10-4x^2) \cdot 2x}{(x^2+7)^2} = \frac{-8x^3-56x - (20x-8x^3)}{(x^2+7)^2} = \frac{-8x^3-56x-20x+8x^3}{(x^2+7)^2} = \frac{-76x}{(x^2+7)^2}$$

$$4. f(x) = \frac{x^5-12x}{2x^2+1} \quad f'(x) = \frac{5x^4 \cdot (2x^2+1) - (x^5-12x) \cdot 4x}{(2x^2+1)^2} = \frac{(10x^6+5x^4) - (4x^6-48x^2)}{(2x^2+1)^2} = \frac{6x^6+5x^4+48x^2}{(2x^2+1)^2}$$

$$5. f(x) = \frac{x^5+4x^3}{e^x} \quad f'(x) = \frac{(5x^4+12x^2) \cdot e^x - (x^5+4x^3) \cdot e^x}{(e^x)^2} = \frac{(5x^4+12x^2) - (x^5+4x^3)}{e^x} = \frac{5x^4+12x^2-x^5-4x^3}{e^x}$$

$$6. f(x) = \frac{2x-x^2}{e^{2x+6}} \quad f'(x) = \frac{(2-2x) \cdot e^{2x+6} - (2x-x^2) \cdot 2e^{2x+6}}{(e^{2x+6})^2} = \frac{(2-2x) - (2x-x^2) \cdot 2}{e^{2x+6}} = \frac{2-2x-4x+2x^2}{e^{2x+6}} = \frac{2-6x+2x^2}{e^{2x+6}}$$

$$7. f(x) = \frac{\sin(x)}{x^6+4x^2} \quad f'(x) = \frac{\cos(x) \cdot (x^6+4x^2) - \sin(x) \cdot (6x^5+8x)}{(x^6+4x^2)^2}$$

$$8. f(x) = \frac{-5x+3}{\sqrt{x^2+1}} \quad f'(x) = \frac{(-5) \cdot (\sqrt{x^2+1}) - (-5x+3) \cdot \frac{1}{2} \cdot 2x \cdot (x^2+1)^{-\frac{1}{2}}}{(\sqrt{x^2+1})^2} = \frac{(-5) \cdot (\sqrt{x^2+1}) - (-5x^2+3x) \cdot (x^2+1)^{-\frac{1}{2}}}{x^2+1}$$

$$9. f(x) = \frac{\cos(x)}{\sqrt{x}+4} \quad f'(x) = \frac{-\sin(x) \cdot (\sqrt{x}+4) - \cos(x) \cdot 0,5 \cdot x^{-\frac{1}{2}}}{(\sqrt{x}+4)^2}$$

$$10. f(x) = \frac{\cos(2x)}{2e^{-4x+1}+4} \quad f'(x) = \frac{-2\sin(2x) \cdot (2e^{-4x+1}+4) - \cos(2x) \cdot (-8) \cdot e^{-4x+1}}{(2e^{-4x+1}+4)^2}$$