APPLYING THE CHAIN RULE

Let f(x) and g(x) be differentiable functions. Recall that the chain rule says that

$$\frac{\mathrm{d}}{\mathrm{d}x}g(f(x)) = g'(f(x)) \cdot f'(x) \; .$$

Here are some examples demonstrating how this rule is applied in specific situations. Try identifying what are g(x) and f(x) in each of these examples.

(1) $\frac{\mathrm{d}}{\mathrm{d}x}(x^4+x)^{100} = 100(x^4+x)^{99} \cdot (x^4+x)'$

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

- (3) $\frac{\mathrm{d}}{\mathrm{d}x}\cos(x^4+x) = -\sin(x^4+x)\cdot(x^4+x)'$
- (4) $\frac{\mathrm{d}}{\mathrm{d}x}e^{(x^4+x)} = e^{(x^4+x)} \cdot (x^4+x)'$

(5)
$$\frac{\mathrm{d}}{\mathrm{d}x}\ln(x^4+x) = \frac{1}{(x^4+x)} \cdot (x^4+x)'$$

(6)
$$\frac{\mathrm{d}}{\mathrm{d}x} \frac{1}{(x^4 + x)^{100}} = \frac{-100}{(x^4 + x)^{101}} \cdot (x^4 + x)'$$