

$$1. f(x) = \frac{x^2-1}{x^3+4} \quad f'(x) = \frac{(x^3+4)(2x) - (x^2-1)(3x^2)}{(x^3+4)^2}$$

$$= \frac{2x^4 + 8x - 3x^4 + 3x^2}{(x^3+4)^2} = \boxed{\frac{-x^4 + 3x^2 + 8x}{(x^3+4)^2}}$$

$$2. f(x) = (x^2-3)(x^4+1)$$

$$f'(x) = (x^2-3)(4x^3) + (2x)(x^4+1)$$

$$= 4x^5 - 12x^3 + 2x^5 + 2x$$

$$= \boxed{6x^5 - 12x^3 + 2x}$$

$$3. g(x) = \frac{x^3-2x^2+1}{x^2-x-1} \rightarrow g'(x) = \frac{(x^2-x-1)(3x^2-4x) - (x^3-2x^2+1)(2x-1)}{(x^2-x-1)^2}$$

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

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

$$4. (x^2 - x - 4)(3x^5 + 7) = h(x)$$

$$h'(x) = (x^2 - x - 4)(15x^4) + (3x^5 + 7)(2x - 1)$$

$$= 15x^6 - 15x^5 - 60x^4 + 6x^6 - 3x^5 + 14x - 7$$

$$= \boxed{21x^6 - 18x^5 - 60x^4 + 14x - 7}$$

$$5. f(x) = \frac{2}{3x^2 - 5} \quad f'(x) = - \frac{6x(2)}{(3x^2 - 5)^2}$$

$$= \boxed{\frac{-12x}{(3x^2 - 5)^2}}$$

$$6. h(x) = \frac{x^4 - 3x^2 + 5x - 1}{3x^3 - 2x^2 + x}$$

$$h'(x) = \frac{(3x^3 - 2x^2 + x)(4x^3 - 6x + 5) - (x^4 - 3x^2 + 5x - 1)(9x^2 - 4x + 1)}{(3x^3 - 2x^2 + x)^2}$$

$$= \boxed{\frac{3x^6 - 4x^5 + 12x^4 - 30x^3 + 16x^2 - 4x + 1}{(3x^3 - 2x^2 + x)^2}}$$