

Find the derivative of the given function.

$$1. f(x) = x^{-4} = -4x^{-5} = \frac{-4}{x^5}$$

$$2. f(x) = \frac{1}{3}x^3 - 2x^2 + 10x - 7$$

$$= \frac{1}{3}(3x^2) - 2(2x) + 10 + 0$$

$$= x^2 - 4x + 10$$

$$3. f(x) = 2x^4 + x^3 - 5x^2 + x - 1$$

$$= 8x^3 + 3x^2 - 10x + 1$$

$$4. f(x) = \frac{10}{x^4} + \frac{3}{x^2} = 10x^{-4} + 3x^{-2}$$

$$= -40x^{-5} + -6x^{-3}$$

$$= \frac{-40}{x^5} - \frac{6}{x^3}$$

$$5. f(x) = (3x-2)(4x+5) \quad (\text{hint: use Product Rule})$$

$$\frac{dy}{dx} = (3x-2)(4) + (4x+5)(3)$$

$$= 12x - 8 + 12x + 15$$

$$= \boxed{24x + 7}$$

$$6. f(x) = x^2(x^3-1) \quad (\text{Product Rule})$$

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

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

$$= \boxed{5x^4 - 2x}$$

$$7. f(x) = \frac{x^2}{x-5} \quad (\text{Quotient Rule})$$

$$\frac{dy}{dx} = \frac{(x-5)(2x) - (x^2)(1)}{(x-5)^2}$$

$$= \frac{2x^2 - 10x - x^2}{(x-5)^2}$$

$$= \frac{x^2 - 10x}{x^2 - 10x + 25}$$

$$8. f(x) = \frac{2x-5}{x} \quad (\text{Quotient Rule})$$

$$\frac{dy}{dx} = \frac{x(2) - (2x-5)(1)}{x^2}$$

$$= \frac{2x - 2x + 5}{x^2}$$

$$= \frac{5}{x^2}$$