

$$a) f(x) = 3x^4 - 2x^3 + x^2 + 11$$

$$f'(x) = 12x^3 - 6x^2 + 2x = \underline{2x(6x^2 - 3x + 1)}$$

$$b) f(x) = \frac{5}{2}x^3 + \frac{1}{3}x + \frac{3}{4}$$

$$f'(x) = \underline{\frac{15}{2}x^2 + \frac{1}{3}}$$

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

$$u = 1$$

$$u' = 0$$

$$v = (4x-1)^5$$

$$v' = 5(4x-1)^4 \cdot 4 = 20(4x-1)^4$$

$$f'(x) = \frac{-20(4x-1)^4}{(4x-1)^{10}} = \underline{\frac{-20}{(4x-1)^6}}$$

$$d) f(x) = \sqrt{3x^2 - 4x}$$

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

$$u' = 6x - 4 = 2(3x - 2)$$

$$f'(x) = \frac{2(3x-2)}{2\sqrt{3x^2-4x}} = \underline{\frac{3x-2}{\sqrt{3x^2-4x}}}$$

$$e) f(x) = (3x^2 - 5x)^3$$

$$u = 3x^2 - 5x \quad u' = 6x - 5$$

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

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

$$u = (4x+1)^2$$

$$u' = 2(4x+1) \cdot 4 = 8(4x+1)$$

$$v = x - 2$$

$$v' = 1$$

$$f'(x) = 8(4x+1)(x-2) + (4x+1)^2$$

$$= (4x+1)[8(x-2) + (4x+1)] = (4x+1)(12x-15) = \underline{3(4x+1)(4x-5)}$$

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

$$u = x^2 - 3x$$

$$u' = 2x - 3$$

$$v = x + 1$$

$$v' = 1$$

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

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

$$h) \quad f(x) = \frac{4-x}{x^2} \quad \begin{array}{ll} u = 4-x & v = x^2 \\ u' = -1 & v' = 2x \end{array}$$

$$f'(x) = \frac{-x^2 - 2x(4-x)}{x^4} = \frac{-x^2 - 8x + 2x^2}{x^2} = \frac{x^2 - 8x}{x^2} = \frac{x(x-8)}{x^2} = \underline{\underline{\frac{x-8}{x}}}$$

$$i) \quad f(x) = (2x^2-3)^2 \quad \begin{array}{ll} u = 2x^2-3 & u' = 4x \end{array}$$

$$f'(x) = 2(2x^2-3) \cdot 4x = \underline{\underline{8x(2x^2-3)}} \quad (= 8x(\sqrt{2}x+\sqrt{3})(\sqrt{2}x-\sqrt{3}))$$

$$j) \quad f(x) = (x+2)^2(x-1)^3 \quad \begin{array}{ll} u = (x+2)^2 & v = (x-1)^3 \\ u' = 2(x+2) & v' = 3(x-1)^2 \end{array}$$

$$\begin{aligned} f'(x) &= 2(x+2)(x-1)^3 + 3(x+2)^2(x-1)^2 \\ &= (x+2)(x-1)^2 [2(x-1) + 3(x+2)] = \underline{\underline{(x+2)(x-1)^2(5x+4)}} \end{aligned}$$