

Derivatives Exercise 3

$$\begin{aligned} 1) \quad f(x) &= (3x^2 - 5x + 1)^4 \\ f'(x) &= 4(3x^2 - 5x + 1)^3 \cdot (6x - 5 + 0) \\ &= 4(3x^2 - 5x + 1)^3 (6x - 5) \end{aligned}$$

$$\begin{aligned} 2) \quad g(x) &= (4x^3 - 2x^2 + 3x - 1)^3 \\ &= 3(4x^3 - 2x^2 + 3x - 1)^2 (12x^2 - 4x + 3 - 0) \\ &= 3(4x^3 - 2x^2 + 3x - 1)^2 (12x^2 - 4x + 3) \end{aligned}$$

$$\begin{aligned} 3) \quad h(m) &= \frac{5}{(2m^3 + 4)^2} \\ &= 5 \cdot (2m^3 + 4)^{-2} \\ h'(m) &= -10(2m^3 + 4)^{-3} \cdot (6m^2 + 0) \\ &= -10(2m^3 + 4)^{-3} (6m^2) \\ &= \frac{-60m^2}{(2m^3 + 4)^3} \\ &= \frac{-60m^2}{2(m^3 + 2)^3} \end{aligned}$$

$$\begin{aligned} 4) \quad q(p) &= \frac{-6}{(3p^2 - 2)^3} \\ &= -6(3p^2 - 2)^{-3} \\ &= 18(3p^2 - 2)^{-4} (6p - 0) \\ &= \frac{18(6p)}{(3p^2 - 2)^4} \\ &= \frac{108}{(3p^2 - 2)^4} \end{aligned}$$

$$6) w = \frac{(2z^3 - 7)^2}{z+2}$$

$$\begin{aligned} w' &= \frac{2(2z^3 - 7)(6z^2)(z+2) - (1)(2z^3 - 7)^2}{(z+2)^2} \\ &= \frac{24z^6 + 48z^5 - 84z^3 - 168z^2 - 4z^6 + 28z^3 - 49}{(z+2)^2} \\ &= \frac{20z^6 + 48z^5 - 56z^3 - 168z^2 - 49}{(z+2)^2} \end{aligned}$$

$$8) z = \left(\frac{x^2 - 2x}{x+4} \right)^4$$

$$\begin{aligned} &= 4 \left(\frac{x^2 - 2x}{x+4} \right)^3 \left(\frac{(2x - 2)(x+4) - (1)(x^2 - 2x)}{(x+4)^2} \right) \\ &= \frac{(4x^2 + 32x - 32)(x^2 - 2x)^3}{(x+4)^5} \\ &= \frac{4x^3(x^2 + 8x - 8)(x-2)^3}{(x+4)^5} \end{aligned}$$

$$10) v = \frac{5}{6} \sqrt[7]{(v^3 - 2v)^3}$$

$$= \frac{5}{6} (v^3 - 2v)^{\frac{3}{7}}$$

$$= \frac{5(v^3 - 2v)^{\frac{3}{7}}}{6}$$

$$= \frac{5}{6} (v^3 - 2v)^{\frac{3}{7}} (3v^2 - 2)(6) - (0) \quad \leftarrow 0 \times \text{anything} = 0$$

$$= \frac{\frac{90}{6} (3v^2 - 2)(v^3 - 2v)^{\frac{3}{7}}}{6^2}$$

$$= \frac{15v^2 - 10}{14 \sqrt[7]{(v^3 - 2v)^4}}$$

$$12) K(x) = (2x^3 - 3)^4 (5x^2 - 2)^3$$

$$\begin{aligned} K'(x) &= 4(2x^3 - 3)^3 (6x^2 - 0)(5x^2 - 2)^3 + 3(5x^2 - 2)^2 (10x - 0)(2x^3 - 3)^4 \\ &= 24x^2(2x^3 - 3)^3 (5x^2 - 2)^3 + 30x(5x^2 - 2)^2 (2x^3 - 3)^4 \\ &= 6x(2x^3 - 3)^3 (5x^2 - 2)^2 (30x^3 - 8x - 15) \end{aligned}$$

$$14) b(a) = \frac{5a^2 - 3}{(2a+1)^5}$$

$$= \frac{(10a - 0)(2a+1)^5 - 5(2a+1)^4 (2+0)(5a^2 - 3)}{(2a+1)^{10}}$$

$$= \frac{(2a+1)^4 (10a(2a+1) - 5 \times 2(5a^2 - 3))}{(2a+1)^{10}}$$

$$= \frac{20a^2 + 10a - 10(5a^2 - 3)}{(2a+1)^6}$$

$$= \frac{-30a^2 + 10a + 30}{(2a+1)^6}$$