

5.12

$$\begin{aligned}
 1) \quad f'(x) &= \left(\frac{x-2}{3-x} \right)' \\
 &= \frac{(x-2)'(3-x) - (x-2)(3-x)'}{(3-x)^2} \\
 &= \frac{1(3-x) - (x-2)(-1)}{(3-x)^2} \\
 &= \frac{3-x+x-2}{(3-x)^2} \\
 &= \frac{1}{(3-x)^2} \\
 \\
 2) \quad f'(x) &= \left(\frac{2x+3}{4-x} \right)' \\
 &= \frac{(2x+3)'(4-x) - (2x+3)(4-x)'}{(4-x)^2} \\
 &= \frac{2(4-x) - (2x+3)(-1)}{(4-x)^2} \\
 &= \frac{8-2x+2x+3}{(4-x)^2} \\
 &= \frac{11}{(4-x)^2} \\
 \\
 3) \quad f'(x) &= \left(\frac{x-x^3}{2-x} \right)' \\
 &= \frac{(x-x^3)'(2-x) - (x-x^3)(2-x)'}{(2-x)^2} \\
 &= \frac{(1-3x^2)(2-x) - (x-x^3)(-1)}{(2-x)^2} \\
 &= \frac{2-x-6x^2+3x^3+x-x^3}{(2-x)^2} \\
 &= \frac{2x^3-6x^2+2}{(2-x)^2} \\
 \\
 4) \quad f'(x) &= \left(\frac{x^2+4}{2-x} \right)' \\
 &= \frac{(x^2+4)'(2-x) - (x^2+4)(2-x)'}{(2-x)^2} \\
 &= \frac{2x(2-x) - (x^2+4)(-1)}{(2-x)^2}
 \end{aligned}$$

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

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

$$\begin{aligned} 5) \quad f'(x) &= \left(\frac{x^3 - x^2}{4-x} \right)' \\ &= \frac{(x^3 - x^2)'(4-x) - (x^3 - x^2)(4-x)'}{(4-x)^2} \\ &= \frac{(3x^2 - 2x)(4-x) - (x^3 - x^2)(-1)}{(4-x)^2} \\ &= \frac{12x^2 - 3x^3 - 8x + 2x^2 + x^3 - x^2}{(4-x)^2} \\ &= \frac{-2x^3 + 13x^2 - 8x}{(4-x)^2} \end{aligned}$$

$$\begin{aligned} 6) \quad f'(x) &= \left(\frac{x-7}{x^2-3} \right)' \\ &= \frac{(x-7)'(x^2-3) - (x-7)(x^2-3)'}{(x^2-3)^2} \\ &= \frac{1(x^2-3) - (x-7)2x}{(x^2-3)^2} \\ &= \frac{x^2-3-2x^2+14x}{(x^2-3)^2} \\ &= \frac{-x^2+14x-3}{(x^2-3)^2} \end{aligned}$$

$$\begin{aligned} 7) \quad f'(x) &= \left(\frac{4-x^2}{x+7} \right)' \\ &= \frac{(4-x^2)'(x+7) - (4-x^2)(x+7)'}{(x+7)^2} \\ &= \frac{-2x(x+7) - (4-x^2)1}{(x+7)^2} \\ &= \frac{-2x^2-14x-4+x^2}{(x+7)^2} \\ &= \frac{-x^2-14x-4}{(x+7)^2} \end{aligned}$$

$$\begin{aligned}
8) \quad f'(x) &= \left(\frac{4 - x^3}{x - 5} \right)' \\
&= \frac{(4 - x^3)'(x - 5) - (4 - x^3)(x - 5)'}{(x - 5)^2} \\
&= \frac{-3x^2(x - 5) - (4 - x^3)1}{(x - 5)^2} \\
&= \frac{-3x^3 + 15x^2 - 4 + x^3}{(x - 5)^2} \\
&= \frac{-2x^3 + 15x^2 - 4}{(x - 5)^2}
\end{aligned}$$