5.8

1) $f'(x) = (4\,x^2 - 5\,x + 6)'$
$= (4\,x^2)' + (-5\,x)' + (6)'$
$= 4\,(x^2)' + (-5)\,(x)' + (6)'$
$= 4 \cdot 2\,x - 5 \cdot 1 + 0$
$= 8\,x - 5$

2) $f'(x) = (2\,x^3 + 2\,x + 1)'$
$= (2\,x^3)' + (2\,x)' + (1)'$
$= 2\,(x^3)' + 2\,(x)' + (1)'$
$= 2 \cdot 3\,x^2 + 2 \cdot 1 + 0$
$= 6\,x^2 + 2$

3) $f'(x) = (x^2 + 5\,x + 1)'$
$= (x^2)' + (5\,x)' + (1)'$
$= (x^2)' + 5\,(x)' + (1)'$
$= 2\,x + 5 \cdot 1 + 0$
$= 2\,x + 5$

4) $f'(x) = (x^5 - 3\,x^2 + 1)'$
$= (x^5)' + (-3\,x^2)' + (1)'$
$= (x^5)' + (-3)\,(x^2)' + (1)'$
$= 5\,x^4 - 3 \cdot 2\,x + 0$
$= 5\,x^4 - 6\,x$

5) $f'(x) = (3\,x^2 - 6\,x - 12)'$
$= (3\,x^2)' + (-6\,x)' + (-12)'$
$= 3\,(x^2)' + (-6)\,(x)' + (-12)'$
$= 3 \cdot 2\,x - 6 \cdot 1 + 0$
$= 6\,x - 6$

6) $f'(x) = (4\,x^3 + 2\,x - 1)'$
$= (4\,x^3)' + (2\,x)' + (-1)'$
$= 4\,(x^3)' + 2\,(x)' + (-1)'$
$= 4 \cdot 3\,x^2 + 2 \cdot 1 + 0$
$= 12\,x^2 + 2$

7) $f'(x) = (2\,x^5 + 5\,x^4 - 8)'$
$= (2\,x^5)' + (5\,x^4)' + (-8)'$
$= 2\,(x^5)' + 5\,(x^4)' + (-8)'$
$= 2 \cdot 5\,x^4 + 5 \cdot 4\,x^3 + 0$

$$= 10\,x^4 + 20\,x^3$$

8) $$\begin{aligned} f'(x) &= (4\,x^3 + 7\,x^2 - 8\,x + 5)' \\ &= (4\,x^3)' + (7\,x^2)' + (-8\,x)' + (5)' \\ &= 4\,(x^3)' + 7\,(x^2)' + (-8)\,(x)' + (5)' \\ &= 4 \cdot 3\,x^2 + 7 \cdot 2\,x - 8 \cdot 1 + 0 \\ &= 12\,x^2 + 14\,x - 8 \end{aligned}$$

9) $$\begin{aligned} f'(x) &= (8\,x^{10} - 5\,x^6 - 20\,x^3)' \\ &= (8\,x^{10})' + (-5\,x^6)' + (-20\,x^3)' \\ &= 8\,(x^{10})' + (-5)\,(x^6)' + (-20)\,(x^3)' \\ &= 8 \cdot 10 \cdot x^9 - 5 \cdot 6\,x^5 - 20 \cdot 3\,x^2 \\ &= 80\,x^9 - 30\,x^5 - 60\,x^2 \end{aligned}$$

10) $$\begin{aligned} f'(x) &= (\tfrac{1}{3}\,x^4 - \sqrt{2})' \\ &= (\tfrac{1}{3}\,x^4)' + (-\sqrt{2})' \\ &= \tfrac{1}{3}\,(x^4)' + (-\sqrt{2})' \\ &= \tfrac{1}{3} \cdot 4\,x^3 + 0 \\ &= \tfrac{4}{3}\,x^3 \end{aligned}$$

11) $$\begin{aligned} f'(x) &= (\tfrac{1}{3}\,x^3 + \tfrac{5}{2}\,x^2 + 6\,x + 1)' \\ &= (\tfrac{1}{3}\,x^3)' + (\tfrac{5}{2}\,x^2)' + (6\,x)' + (1)' \\ &= \tfrac{1}{3}\,(x^3)' + \tfrac{5}{2}\,(x^2)' + 6\,(x)' + (1)' \\ &= \tfrac{1}{3} \cdot 3\,x^2 + \tfrac{5}{2} \cdot 2\,x + 6 \cdot 1 + 0 \\ &= x^2 + 5\,x + 6 \end{aligned}$$

12) $$\begin{aligned} f'(x) &= (\tfrac{1}{4}\,x^2 + \sqrt{5}\,x - \tfrac{\pi}{3})' \\ &= (\tfrac{1}{4}\,x^2)' + (\sqrt{5}\,x)' + (-\tfrac{\pi}{3})' \\ &= \tfrac{1}{4}\,(x^2)' + \sqrt{5}\,(x)' + (-\tfrac{\pi}{3})' \\ &= \tfrac{1}{4} \cdot 2\,x + \sqrt{5} \cdot 1 + 0 \\ &= \tfrac{1}{2}\,x + \sqrt{5} \end{aligned}$$