Exercice 4.4.

a) $[(x^2+5x+6)^4]' = 4\cdot(x^2+5x+6)^3\cdot(x^2+5x+6)' = \boxed{4(x^2+5x+6)^3(2x+5)}$

$$\boxed{\begin{array}{l} u(x) = x^2+5x+6 \\ u'(x) = 2x+5 \end{array}}$$

b) $[(5x^3-8x+1)^7]' = 7\cdot(5x^3-8x+1)^6\cdot(5x^3-8x+1)' = \boxed{7(5x^3-8x+1)^6(15x^2-8)}$

$$\boxed{\begin{array}{l} u(x) = 5x^3-8x+1 \\ u'(x) = 15x^2-8 \end{array}}$$

c) $\left[\dfrac{(x-3)^3}{(2x+7)^3}\right]' \overset{\text{p.96}}{=} \dfrac{[(x-3)^3]'(2x+7)^3 - (x-3)^3\cdot[(2x+7)^3]'}{(2x+7)^6} =$

$$\boxed{\begin{array}{l|l} u(x) = (x-3)^3 & v(x) = (2x+7)^3 \\ u'(x) = 3(x-2)^2\cdot 1 & v'(x) = 3(2x+7)^2\cdot 2 \end{array}}$$

$$= \frac{3\cdot(x-3)^2\cdot 1\cdot(2x+7)^3 - (x-3)^3\cdot 3(2x+7)^2\cdot 2}{(2x+7)^6} =$$

$$= \frac{3(x-3)^2(2x+7)^2[(2x+7)-2(x-3)]}{(2x+7)^6} = \frac{3(x-3)^2(2x+7)^2\cdot 13}{(2x+7)^6} = \boxed{\frac{39(x-3)^2}{(2x+7)^4}}$$

d) $[(4x^2+5)^4\cdot(6x^2-5)^3]' \overset{\text{p.94}}{=} [(4x^2+5)^4]'(6x^2-5)^3 + (4x^2+5)^4\cdot[(6x^2-5)^3]' =$

$$\boxed{\begin{array}{l|l} u(x) = (4x^2+5)^4 & v(x) = (6x^2-5)^3 \\ u'(x) = 4(4x^2+5)^3\cdot 8x & v'(x) = 3(6x^2-5)^2\cdot 12x \end{array}}$$

$$= 4(4x^2+5)^3\cdot 8x\cdot(6x^2-5)^3 + (4x^2+5)^4\cdot 3(6x^2-5)^2\cdot 12x =$$

$$= 4x(4x^2+5)^3(6x^2-5)^2[8(6x^2-5)+9(4x^2+5)] =$$

$$= 4x(4x^2+5)^3(6x^2-5)^2(48x^2-40+36x^2+45) = \boxed{4x(4x^2+5)^3(6x^2-5)^2(84x^2+5)}$$