2.4

a) $(3x^3+2x^2+x)' = 9x^2+4x+1$

b) $\left(\frac{1}{5}x^5-\frac{1}{2}x^4+\frac{2}{3}x^3-x^2+x-5\right)' =$

$= \frac{1}{5}\cdot 5x^4 - \frac{1}{2}\cdot 4x^3 + \frac{2}{3}\cdot 3x^2 - 2x + 1 - 0 = x^4-2x^3+2x^2-2x+1$

c) $\left(\frac{x^2}{16}-\frac{5x}{4}+\frac{7}{6}\right)' =$

$= \frac{2x}{16} - \frac{5}{4} + 0 = \frac{x}{8} - \frac{5}{4}$

d) $\left(\frac{5x^3+9x}{2}\right)' =$

$= \frac{(15x^2+9)\cdot 2 - (5x^3+9x)\cdot 0}{2^2} = \frac{15x^2+9}{2}$

e) $\left(-\frac{1}{x^5}\right)' =$

$= -\frac{0\cdot x^5 - 1\cdot 5x^4}{x^{10}} = \frac{5}{x^6}$

f) $\left((3x-4)^5\right)' = 5(3x-4)^4\cdot 3 = 15(3x-4)^4$

g) $\left((x^2+4x-5)^3\right)' = 3(x^2+4x-5)^2\cdot(2x+4)$

h) $\left(\frac{1}{(x-9)^3}\right)' =$

$= \frac{0\cdot(x-9)^3 - 1\cdot 3(x-9)^2\cdot 1}{(x-9)^6} = \frac{-3(x-9)^2}{(x-9)^6} = \frac{-3}{(x-9)^4}$

i) $\left(\frac{2-3x}{2x-1}\right)' =$

$= \frac{-3(2x-1)-(2-3x)\cdot 2}{(2x-1)^2} = \frac{-6x+3-4+6x}{(2x-1)^2} = \frac{-1}{(2x-1)^2}$

j) $\left(\frac{x^2+4x+10}{x+1}\right)' =$

$= \frac{(2x+4)(x+1)-(x^2+4x+10)\cdot 1}{(x+1)^2} = \frac{2x^2+2x+4x+4-x^2-4x-10}{(x+1)^2} =$

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

k) $\left(\frac{x^2+9x+18}{x+2}\right)' =$

$= \frac{(2x+9)(x+2)-(x^2+9x+18)\cdot 1}{(x+2)^2} = \frac{2x^2+4x+9x+18-x^2-9x-18}{(x+2)^2} =$

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

l) $(-x^3\cdot(x-5)^2)'$

$u = -x^3 \rightarrow u' = -3x^2$

$v = (x-5)^2 \rightarrow v' = 2(x-5)^1 \cdot 1 = 2(x-5)$

$(u\cdot v)' = u'v + uv' \Rightarrow$

$\Rightarrow (-x^3\cdot(x-5)^2) = -3x^2(x-5)^2 + (-x^3)\cdot 2(x-5) =$

$= x^2(x-5)\cdot[-3(x-5)-2x] = x^2(x-5)(\underbrace{-3x+15-2x}_{-5x+15}) =$

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

m) $\left((2x+3)^3 \cdot (x-2)^2\right)'$

$u = (2x+3)^3 \rightarrow u' = 3(2x+3)^2 \cdot 2 = 6(2x+3)^2$

$v = (x-2)^2 \rightarrow v' = 2(x-2)^1 \cdot 1 = 2(x-2)$

$(u \cdot v)' = u' \cdot v + u \cdot v' \Rightarrow$

$\Rightarrow \left((2x+3)^3 \cdot (x-2)^2\right)' = 6(2x+3)^2(x-2)^2 + (2x+3)^3 \cdot 2(x-2) =$

$= 2(2x+3)^2(x-2) \cdot \underbrace{[3(x-2)+(2x+3)]}_{3x-6+2x+3} =$

$= 2(2x+3)^2(x-2)(5x-3)$

n) $\left(\frac{(x^2-9)^3}{(x-2)^2}\right)'$

$u = (x^2-9)^3 \rightarrow u' = 3(x^2-9)^2 \cdot 2x = 6x(x^2-9)^2$

$v = (x-2)^2 \rightarrow v' = 2(x-2)^1 \cdot 1 = 2(x-2)$

$\left(\frac{u}{v}\right)' = \frac{u' \cdot v - u \cdot v'}{v^2} \Rightarrow$

$\Rightarrow \left(\frac{(x^2-9)^3}{(x-2)^2}\right)' = \frac{6x(x^2-9)^2 \cdot (x-2)^2 - (x^2-9)^3 \cdot 2(x-2)}{(x-2)^4} =$

$= \frac{2(x^2-9)^2(x-2) \cdot [3x(x-2) - (x^2-9)]}{(x^2-2)^4} =$

$= \frac{2(x^2-9)^2(x-2)(3x^2-6x-x^2+9)}{(x^2-2)^{4-3}} =$

$= \frac{2(x+3)^2(x-3)^2(2x^2-6x+9)}{(x-2)^3}$