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1.

$$\frac{3x^5 - 3x^2 + 2x - 5}{x^3 - x + 1}$$

$$\begin{array}{rrrrrcrcl}
(3x^5 & & -3x^2 & +2x & -5) & : & (x^3 - x + 1) & = & 3x^2 + 3 \\
\cline{1-5}
-3x^5 & +3x^3 & -3x^2 & & & & & & \\
\cline{1-5}
 & 3x^3 & -6x^2 & +2x & -5 & & & & \\
 & -3x^3 & & +3x & -3 & & & & \\
\cline{1-5}
 & & -6x^2 & +5x & -8 & & & &
\end{array}$$

$$\frac{3x^5 - 3x^2 + 2x - 5}{x^3 - x + 1} = 3x^2 + 3 + \frac{-6x^2 + 5x - 8}{x^3 - x + 1}$$

2.

$$\frac{9x^3 - 4x + 1}{x^4 - x^2} = \frac{9x^3 - 4x + 1}{x^2(x+1)(x-1)} = \frac{A}{x} + \frac{B}{x^2} + \frac{C}{x+1} + \frac{D}{x-1}$$

$$\begin{aligned}
9x^3 - 4x + 1 &= Ax(x+1)(x-1) + B(x+1)(x-1) + Cx^2(x-1) + Dx^2(x+1) \\
9x^3 - 4x + 1 &= A(x^3 - x) + B(x^2 - 1) + C(x^3 - x^2) + D(x^3 + x^2)
\end{aligned}$$

$$\begin{aligned}
x^3: \quad 9 &= A + C + D && (1) \\
x^2: \quad 0 &= B - C + D && (2) \\
x: \quad -4 &= -A \Rightarrow A = 4 && (3) \\
x^0: \quad 1 &= -B \Rightarrow B = -1 && (4)
\end{aligned}$$

$$\begin{aligned}
(1): \quad 5 &= C + D \\
(2): \quad 1 &= -C + D \\
(1) + (2): \quad 6 &= 2D \Rightarrow D = 3 \\
(1): \quad C &= 5 - D \Rightarrow C = 2
\end{aligned}$$

$$\frac{9x^3 - 4x + 1}{x^4 - x^2} = \frac{4}{x} - \frac{1}{x^2} + \frac{2}{x+1} + \frac{3}{x-1}$$