* for 1 term denominator (divisor) use splitting fraction.
* for multiple term denominator (divisor) use Long Division.

NO Synthetic Division because synthetic division only work when denominator (divisor) is binomial (2 terms).

---

288) $15r^4s^9 \div (15r^4s^9) = \dfrac{15r^4s^9}{15r^4s^9} = \underline{\underline{1}}$

---

290) $\dfrac{\overset{2}{\cancel{18}}\, a^4 b^8}{\underset{-3}{\cancel{-27}}\, a^9 b^5} = \dfrac{2\, b^3}{-3\, a^5} = \underline{\underline{\dfrac{-2b^3}{3a^5}}}$

---

292) $\dfrac{(\overset{2}{\cancel{10}} m^5 n^4)(\overset{1}{\cancel{5}} m^3 n^6)}{\cancel{25} m^7 n^5} = \dfrac{2 m^8 n^{10}}{m^7 n^5} = \underline{\underline{2mn^5}}$

$\cancel{5}$

1

---

294) $\dfrac{(\overset{1}{\cancel{6}} a^4 b^3)(\overset{2}{\cancel{4}} a b^5)}{(\cancel{12} a^2 b)(a^3 b)} = \dfrac{2a^5 b^8}{a^5 b^2} = \underline{\underline{2b^6}}$

$\cancel{2}$

1

296) $(9n^4+6n^3)\div 3n = \dfrac{9n^4+6n^3}{3n} = \dfrac{9n^4}{3n} + \dfrac{6n^3}{3n}$

$= \underline{\underline{3n^3+2n^2}}$

---

298) $(63m^4-42m^3)\div(-7m^2) = \dfrac{63m^4-42m^3}{(-7m^2)} = \dfrac{63m^4}{(-7m^2)} - \dfrac{42m^3}{(-7m^2)}$

$= \underline{\underline{-9m^2+6m}}$

---

300) $\dfrac{66x^3y^2-110x^2y^3-44x^4y^3}{11x^2y^2} = \dfrac{66x^3y^2}{11x^2y^2} - \dfrac{110x^2y^3}{11x^2y^2} - \dfrac{44x^4y^3}{11x^2y^2}$

$= \underline{\underline{6x-10y-4x^2}}$

---

302) $\dfrac{10x^2+5x-4}{-5x} = \dfrac{10x^2}{(-5x)} + \dfrac{5x}{(-5x)} - \dfrac{4}{(-5x)} = \underline{\underline{-2x-1+\dfrac{4}{5x}}}$

---

304) $(y^2+7y+12)\div(y+3) = \dfrac{y^2+7y+12}{y+3} = \underline{\underline{y+4}}$

$$
\begin{array}{r|l}
 & y+4 \\
\hline
y+3 & y^2+7y+12 \\
 & -(y^2+3y) \\
\hline
 & +4y+12 \\
 & -(+4y+12) \\
\hline
 & 0
\end{array}
$$

306) $(6m^2-19m-20)\div(m-4)=\dfrac{6m^2-19m-20}{m-4}=\underline{\underline{6m+5}}$

$$
\begin{array}{r|l}
 & 6m+5 \\ \hline
m-4 & 6m^2-19m-20 \\
 & -(6m^2-24m) \\ \hline
 & \quad +5m-20 \\
 & \quad -(+5m-20) \\ \hline
 & \qquad 0
\end{array}
$$

---

308) $(q^2+2q+20)\div(q+6)=\dfrac{q^2+2q+20}{q+6}=q-4+\dfrac{(+44)}{q+6}$

$$
\begin{array}{r|l}
 & q-4 \\ \hline
q+6 & q^2+2q+20 \\
 & -(q^2+6q) \\ \hline
 & \quad -4q+20 \\
 & \quad -(-4q-24) \\ \hline
 & \qquad +44
\end{array}
$$

$=\underline{\underline{q-4+\dfrac{44}{q+6}}}$

---

310) $(3b^3+b^2+4)\div(b+1)=\dfrac{3b^3+b^2+4}{b+1}=3b^2-2b+2+\dfrac{(+2)}{b+1}$

$$
\begin{array}{r|l}
 & 3b^2-2b+2 \\ \hline
b+1 & 3b^3+b^2+0b+4 \\
 & -(3b^3+3b^2) \\ \hline
 & \quad -2b^2+0b \\
 & \quad -(-2b^2-2b) \\ \hline
 & \qquad +2b+4 \\
 & \qquad -(+2b+2) \\ \hline
 & \qquad\quad +2
\end{array}
$$

$=\underline{\underline{3b^2-2b+2+\dfrac{2}{b+1}}}$

312) $(z^3+1) \div (z+1) = \dfrac{z^3+1}{z+1} = \underline{\underline{z^2 - z + 1}}$

$$
\begin{array}{r l}
 & z^2 - z + 1 \\
z+1 \,\big) & z^3 + 0z^2 + 0z + 1 \\
 & -(z^3 + z^2) \\
\hline
 & -z^2 + 0z \\
 & -(-z^2 - z) \\
\hline
 & +z + 1 \\
 & -(+z + 1) \\
\hline
 & 0
\end{array}
$$

---

314) $(64x^3 - 27) \div (4x-3) = \dfrac{64x^3-27}{4x-3} = 16x^2 + 12x + 9$

$$
\begin{array}{r l}
 & 16x^2 + 12x + 9 \\
4x-3 \,\big) & 64x^3 + 0x^2 + 0x - 27 \\
 & -(64x^3 - 48x^2) \\
\hline
 & +48x^2 + 0x \\
 & -(+48x^2 - 36x) \\
\hline
 & +36x - 27 \\
 & -(+36x - 27) \\
\hline
 & 0
\end{array}
$$

31.6) $\dfrac{x^3-6x^2+5x+14}{x+1} = x^2-7x+12+\dfrac{(+2)}{x+1} = \underline{\underline{x^2-7x+12+\dfrac{2}{x+1}}}$

$$
\begin{array}{r|l}
 & x^2-7x+12 \\
\hline
x+1 & x^3-6x^2+5x+14 \\
 & -(x^3+x^2) \\
\hline
 & \quad -7x^2+5x \\
 & \quad -(-7x^2-7x) \\
\hline
 & \qquad +12x+14 \\
 & \qquad -(+12x+12) \\
\hline
 & \qquad\qquad +2
\end{array}
$$

31.8) $\dfrac{2x^3-11x^2+11x+12}{x-3} = \underline{\underline{2x^2-5x-4}}$

$$
\begin{array}{r|l}
 & 2x^2-5x-4 \\
\hline
x-3 & 2x^3-11x^2+11x+12 \\
 & -(2x^3-6x^2) \\
\hline
 & \quad -5x^2+11x \\
 & \quad -(-5x^2+15x) \\
\hline
 & \qquad -4x+12 \\
 & \qquad -(-4x+12) \\
\hline
 & \qquad\qquad 0
\end{array}
$$

320) $\dfrac{x^4-5x^2+13x+3}{x+3} = \underline{\underline{x^3-3x^2+4x+1}}$

$$\begin{array}{r} x^3-3x^2+4x+1 \\ x+3 \,\overline{)\, x^4+0x^3-5x^2+13x+3} \\ -(x^4+3x^3) \\ \hline -3x^3-5x^2 \\ -(-3x^3-9x^2) \\ \hline +4x^2+13x \\ -(+4x+12x) \\ \hline +x+3 \\ -(+x+3) \\ \hline 0 \end{array}$$

---

322) $\dfrac{2x^4-9x^3+5x^2-3x-6}{x-4} = 2x^3-x^2+x+1+\dfrac{(-6)}{x-4}$

$= \underline{\underline{2x^3-x^2+x+1-\dfrac{6}{x-4}}}$

$$\begin{array}{r} 2x^3-x^2+x+1 \\ x-4 \,\overline{)\, 2x^4-9x^3+5x^2-3x-6} \\ -(2x^4-8x^3) \\ \hline -x^3+5x^2 \\ -(-x^3+4x^2) \\ \hline +x^2-3x \\ -(+x^2-4x) \\ \hline +x-6 \\ -(+x-4) \\ \hline -6 \end{array}$$

324) $f(x) = x^2 - 13x + 36$ $\qquad g(x) = x - 4$

a) $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} = \frac{x^2 - 13x + 36}{x - 4}$

$= \underline{\underline{x - 9}}$

$$\begin{array}{r} x - 9 \\ x - 4 \overline{\big) x^2 - 13x + 36} \\ -(x^2 - 4x) \\ \hline -9x + 36 \\ -(-9x + 36) \\ \hline 0 \end{array}$$

b) $\left(\frac{f}{g}\right)(-1) = \frac{f(-1)}{g(-1)}$

$= \frac{(-1)^2 - 13(-1) + 36}{(-1) - 4} = \frac{1 + 13 + 36}{-5}$

$= \frac{50}{-5} = \underline{\underline{-10}}$

326) $f(x) = x^3 + x^2 - 7x + 2$ $\qquad g(x) = x - 2$

a) $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} = \frac{x^3 + x^2 - 7x + 2}{x - 2}$

$= \underline{\underline{x^2 + 3x - 1}}$

$$\begin{array}{r} x^2 + 3x - 1 \\ x - 2 \overline{\big) x^3 + x^2 - 7x + 2} \\ -(x^3 - 2x^2) \\ \hline +3x^2 - 7x \\ -(+3x - 6x) \\ \hline -x + 2 \\ -(-x + 2) \\ \hline 0 \end{array}$$

b) $\left(\frac{f}{g}\right)(2) = \frac{f(2)}{g(2)}$

$= \frac{(2)^3 + (2)^2 - 7(2) + 2}{(2) - 2}$

$= \frac{8 + 4 - 14 + 2}{0}$

$= \frac{0}{0}$

this is indeterminate form.
technique of evaluating will be learned in a Calculus class.

328) $f(x) = x^2 - 3x + 2$ $\quad g(x) = x + 3$

a) $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} = \frac{x^2 - 3x + 2}{x + 3}$

$= x - 6 + \frac{(+20)}{x+3}$

$$\begin{array}{r} x - 6 \\ x+3 \overline{)\, x^2 - 3x + 2} \\ -(x^2 + 3x) \\ \hline -6x + 2 \\ -(-6x - 18) \\ \hline +20 \end{array}$$

$= x - 6 + \frac{20}{x+3}$

b) $\left(\frac{f}{g}\right)(3) = \frac{f(3)}{g(3)}$

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

$= \frac{9 - 9 + 2}{6} = \frac{2}{6} = \frac{1}{3}$

---

330) $f(x) = x^3 - 8x + 7$ $\quad x + 3 \rightarrow x + 3 = 0$, $-3 \;\; -3$, $x = -3$

$f(-3) = (-3)^3 - 8(-3) + 7 = -27 + 24 + 7 = 4$

---

332) $f(x) = 2x^3 - 6x - 24$ $\quad x - 3 \rightarrow x - 3 = 0$, $+3 \;\; +3$, $x = 3$

$f(3) = 2(3)^3 - 6(3) - 24 = 54 - 18 - 24 = 12$

---

334) $x + 3 \rightarrow x + 3 = 0$, $-3 \;\; -3$, $x = -3$ $\quad$ let $f(x) = x^3 + 8x^2 + 21x + 18$

$f(-3) = (-3)^3 + 8(-3)^2 + 21(-3) + 18 = -27 + 72 - 63 + 18 = 90 - 90 = 0$

yes, $x + 3$ is a factor of $x^3 + 8x^2 + 21x + 18$

---

336) $x - 2 \rightarrow x - 2 = 0$, $+2 \;\; +2$, $x = 2$ $\quad$ let $f(x) = x^3 - 7x^2 + 7x - 6$

$f(2) = (2)^3 - 7(2)^2 + 7(2) - 6 = 8 - 28 + 14 - 6 = -12$

no, $x - 2$ is not a factor of $x^3 - 7x^2 + 7x - 6$