

$$19. (x^2 + 5x + 6) \div (x + 1) = \boxed{x + 4 + \frac{2}{x+1}}$$

$$\begin{array}{r} -1 \overline{) 1 \ 5 \ 6} \\ \underline{-1 \quad -4} \\ 1 \ 4 \ \underline{2} \end{array}$$

$$20. (x^4 + 6x^3 + 6x^2) \div (x + 5) = \boxed{x^3 + x^2 + x - 5 + \frac{25}{x+5}}$$

$$\begin{array}{r} -5 \overline{) 1 \ 6 \ 6 \ 0 \ 0} \\ \underline{-5 \quad -5 \quad -5 \quad 25} \\ 1 \ 1 \ 1 \ -5 \ \underline{25} \end{array}$$

$$21. (x^2 + 9x + 6) \div (x + 8) = \boxed{x + 1 - \frac{2}{x+8}}$$

$$\begin{array}{r} -8 \overline{) 1 \ 9 \ 6} \\ \underline{-8 \quad -8} \\ 1 \ 1 \ \underline{-2} \end{array}$$

$$22. (2x^2 + 3x - 20) \div (x - 2) = \boxed{2x + 7 - \frac{6}{x-2}}$$

$$\begin{array}{r} 2 \overline{) 2 \ 3 \ -20} \\ \underline{4 \quad 14} \\ 2 \ 7 \ \underline{-6} \end{array}$$

$$23. (2x^2 + 13x - 8) \div (x - \frac{1}{2}) = 2x + 14 - \frac{1}{x - \frac{1}{2}} \cdot \frac{2}{2}$$

$$\begin{array}{r} \frac{1}{2} \overline{) 2 \ 13 \ -8} \\ \underline{1 \quad 7} \\ 2 \ 14 \ \underline{-1} \end{array}$$

$$= \boxed{2x + 14 - \frac{2}{2x-1}}$$

$$24. (4x^2 + 5x + 1) \div (x + 1) = \boxed{4x + 1}$$

$$\begin{array}{r} -1 \overline{) 4 \ 5 \ 1} \\ \underline{-4 \quad -1} \\ 4 \ 1 \ \underline{0} \end{array}$$

$$25. \begin{array}{r|rrrr} 4 & 2 & -5 & -3 & \\ & & 8 & 12 & \\ \hline & 2 & 3 & 9 & \end{array}$$

$$P(4) = 9$$

$$26. \begin{array}{r|rrrr} -1 & 4 & -5 & 0 & 3 \\ & & -4 & 9 & -9 \\ \hline & 4 & -9 & 9 & -6 \end{array}$$

$$P(-1) = -6$$

$$27. \begin{array}{r|rrrr} -\frac{1}{3} & 3 & 5 & -1 & 2 \\ & & -1 & -\frac{4}{3} & \frac{7}{9} \\ \hline & 3 & 4 & -\frac{7}{3} & \frac{25}{9} \end{array}$$

$$P(-\frac{1}{3}) = \frac{25}{9}$$

$$28. \begin{array}{r|rrrr} \frac{4}{5} & 25 & 0 & -16 & \\ & & 20 & 16 & \\ \hline & 25 & 20 & 0 & \end{array}$$

$$P(\frac{4}{5}) = 0$$

$$29. I = (0.5t^3 + 4.5t^2 + 4t) \div (t+1)$$

$$\begin{array}{r|rrrr} -1 & 0.5 & 4.5 & 4 & 0 \\ & & -0.5 & -4 & 0 \\ \hline & 0.5 & 4 & 0 & 0 \end{array}$$

$$I(t) = 0.5t^2 + 4t$$

$$50. \begin{array}{r|rrrr} -3 & 3 & 5 & 2 & -12 \\ & & -9 & 12 & -42 \\ \hline & 3 & -4 & 14 & -54 \end{array}$$

NO, $x+3$ is not a factor because it does not divide evenly into $3x^3 + 5x^2 + 2x - 1$

$$57. \boxed{P(4) = -1187842}$$

$$\begin{array}{r} -4 \mid 4 \quad 0 \quad 7 \quad -6 \quad 0 \quad -5 \quad 0 \quad -1 \quad 3 \quad -2 \\ \quad -16 \quad 64 \quad -284 \quad 1160 \quad -4640 \quad 18560 \quad -74240 \quad 296960 \quad -1187840 \\ \hline 4 \quad -16 \quad 71 \quad -290 \quad 1160 \quad -4645 \quad 18560 \quad -74241 \quad 296963 \quad -1187842 \end{array}$$

$$58. \begin{array}{r} -1 \mid 4 \quad 0 \quad 7 \quad -6 \quad 0 \quad -5 \quad 0 \quad -1 \quad 3 \quad -2 \\ \quad -4 \quad 4 \quad -11 \quad 17 \quad -17 \quad 22 \quad -22 \quad 23 \quad -26 \\ \hline 4 \quad -4 \quad 11 \quad -17 \quad 17 \quad -22 \quad 22 \quad -23 \quad 26 \quad -28 \end{array}$$

$$\boxed{P(-1) = -28}$$

$$59. \begin{array}{r} 1 \mid 4 \quad 0 \quad 7 \quad -6 \quad 0 \quad -5 \quad 0 \quad -1 \quad 3 \quad -2 \\ \quad 4 \quad 4 \quad 11 \quad 5 \quad 5 \quad 0 \quad 0 \quad -1 \quad 2 \\ \hline 4 \quad 4 \quad 11 \quad 5 \quad 5 \quad 0 \quad 0 \quad -1 \quad 2 \quad 0 \end{array}$$

$$\boxed{P(1) = 0}$$

$$60. \begin{array}{r} 3 \mid 4 \quad 0 \quad 7 \quad -6 \quad 0 \quad -5 \quad 0 \quad -1 \quad 3 \quad -2 \\ \quad 12 \quad 36 \quad 129 \quad 369 \quad 1107 \quad 3306 \quad 9918 \quad 29751 \quad 89262 \\ \hline 4 \quad 12 \quad 43 \quad 123 \quad 369 \quad 1102 \quad 3306 \quad 9917 \quad 29754 \quad 89260 \end{array}$$

$$\boxed{P(3) = 89260}$$

$$17. (x-3); P(x) = 4x^6 - 12x^5 + 2x^3 - 6x^2 - 5x + 10$$

$$\begin{array}{r} 3 \mid 4 \quad -12 \quad 0 \quad 2 \quad -6 \quad -5 \quad 10 \\ \quad 12 \quad 0 \quad 0 \quad 6 \quad 0 \quad -15 \\ \hline 4 \quad 0 \quad 0 \quad 2 \quad 0 \quad -5 \quad 5 \end{array}$$

No, $(x-3)$ is NOT a factor of $P(x)$

$$18. (x-8); P(x) = x^5 - 8x^4 + 8x - 64$$

$$\begin{array}{r} 8 \mid 1 \quad -8 \quad 0 \quad 0 \quad 8 \quad -64 \\ \quad 8 \quad 0 \quad 0 \quad 0 \quad 64 \\ \hline 1 \quad 0 \quad 0 \quad 0 \quad 8 \quad 0 \end{array}$$

Yes, $(x-8)$ is a factor of $P(x)$.

19. $(3x+12); P(x) = 3x^4 + 12x^3 + 6x + 24$

$$\begin{array}{r} -4 \overline{) 3 \quad 12 \quad 0 \quad 6 \quad 24} \\ \underline{-12 \quad 0 \quad 0 \quad -24} \\ 3 \quad 0 \quad 0 \quad 6 \quad \underline{0} \end{array}$$

Yes, $(3x+12)$ is a factor of $P(x)$

40. $q(7) = \frac{1}{6}(7)^3 + \frac{1}{2}(7)^2 + \frac{1}{3}(7) = \boxed{84}$

$$\begin{array}{r} 7 \overline{) \frac{1}{6} \quad \frac{1}{2}(\frac{3}{6}) \quad \frac{1}{3} \quad 0} \\ \underline{\frac{7}{6} \quad \frac{35}{6} \quad 3 \quad 84} \\ 6 \quad \frac{5}{3} \quad 12 \quad \underline{84} \end{array}$$

b $7 \overline{) 1 \quad 3 \quad 2 \quad -504}$

$$\begin{array}{r} \underline{7 \quad 70 \quad 504} \\ 1 \quad 10 \quad 72 \quad \underline{0} \end{array}$$

$n-7$ is a factor because 7 is a root and thus divides evenly.

c. $(n-7)(n^2+10n+72)$

41. $2 \overline{) 1 \quad -2 \quad 5 \quad -9 \quad -2}$

$$\begin{array}{r} \underline{2 \quad 0 \quad 10 \quad 2} \\ 1 \quad 0 \quad 5 \quad 1 \quad \underline{0} \end{array}$$

Yes, $(x-2)$ is a factor

$(x-2)(x^3+5x+1)$

42. $1 \overline{) 4 \quad -4 \quad -2 \quad 3 \quad -1 \quad -7 \quad 7}$

$$\begin{array}{r} \underline{4 \quad 0 \quad -2 \quad 1 \quad 0 \quad -7} \\ 4 \quad 0 \quad -2 \quad 1 \quad 0 \quad -7 \quad \underline{0} \end{array}$$

Yes, $(x-1)$ is a factor

$(x-1)(4x^5-2x^3+x^2-7)$

$$\begin{array}{r}
 43 \quad -2 \mid 2 \quad 4 \quad 0 \quad -6 \quad -9 \quad 6 \\
 \quad \quad -4 \quad 0 \quad 0 \quad 12 \quad -6 \\
 \hline
 2 \quad 0 \quad 0 \quad -6 \quad 3 \quad 0
 \end{array}$$

Yes, $(x+2)$ is a factor

$$(x+2)(2x^4 - 6x + 3)$$

$$\begin{array}{r}
 44 \quad 4 \mid 2 \quad -9 \quad 7 \quad -14 \quad 8 \\
 \quad \quad 8 \quad -4 \quad 12 \quad -8 \\
 \hline
 2 \quad -1 \quad 3 \quad -2 \quad 0
 \end{array}$$

Yes, $(x-4)$ is a factor.

$$(x-4)(2x^3 - x^2 + 3x - 2)$$