

2) a polynomial of degree n is divided by a binomial of degree 1, then the quotient is of degree $(n) - (1) = (n-1)$ degree.

$$\begin{array}{r}
 4) \quad \begin{array}{r}
 2x+1 \\
 x-5 \overline{) 2x^2-9x-5} \\
 \underline{-(2x^2-10x)} \\
 +x-5 \\
 \underline{-(+x-5)} \\
 0
 \end{array}
 \end{array}$$

$$(2x^2-9x-5) \div (x-5) = 2x+1 + (0)$$

quotient: $2x+1$

remainder: 0

$$\begin{array}{r}
 6) \quad \begin{array}{r}
 x-2 \\
 4x-2 \overline{) 4x^2-10x+6} \\
 \underline{-(4x^2-2x)} \\
 -8x+6 \\
 \underline{-(-8x+4)} \\
 +2
 \end{array}
 \end{array}$$

$$(4x^2-10x+6) \div (4x-2) = x-2 + \frac{(+2)}{4x-2}$$

$$\text{quotient: } x-2 \quad = x-2 + \frac{2}{4x-2}$$

remainder: $+2$

$$\begin{array}{r}
 8) \quad \begin{array}{r}
 -x+1 \\
 x+1 \overline{) -x^2+0x-1} \\
 \underline{-(-x^2-x)} \\
 +x-1 \\
 \underline{-(+x+1)} \\
 -2
 \end{array}
 \end{array}$$

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

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

quotient: $-x+1$

remainder: -2

10)

$$\begin{array}{r}
 x^2 + 5x + 25 \\
 x-5 \overline{) x^3 + 0x^2 + 0x - 126} \\
 \underline{-(x^3 - 5x^2)} \\
 + 5x^2 + 0x \\
 \underline{-(5x^2 - 25x)} \\
 + 25x - 126 \\
 \underline{-(25x - 125)} \\
 -1
 \end{array}$$

$$\begin{aligned}
 (x^3 - 126) \div (x-5) &= x^2 + 5x + 25 + \frac{(-1)}{x-5} \\
 &= x^2 + 5x + 25 - \frac{1}{x-5}
 \end{aligned}$$

quotient: $x^2 + 5x + 25$ remainder: -1

12)

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

$$\begin{aligned}
 (x^3 - 3x^2 + 5x - 6) \div (x-2) &= x^2 - x + 1 + \frac{(-4)}{x-2} \\
 &= x^2 - x + 1 - \frac{4}{x-2}
 \end{aligned}$$

quotient: $x^2 - x + 1$ remainder: -4

14)

$$\begin{array}{r}
 3x^2 - 11x + 34 \\
 x+3 \overline{) 3x^3 - 2x^2 + x - 4} \\
 \underline{-(3x^3 + 9x^2)} \\
 -11x^2 + x \\
 \underline{-(-11x^2 - 33x)} \\
 +34x - 4 \\
 \underline{-(+34x + 102)} \\
 -106
 \end{array}$$

$$\begin{aligned}
 (3x^3 - 2x^2 + x - 4) \div (x+3) &= 3x^2 - 11x + 34 + \frac{(-106)}{x+3} \\
 &= 3x^2 - 11x + 34 - \frac{106}{x+3}
 \end{aligned}$$

$$\begin{array}{r}
 16) \quad \begin{array}{r} 6x^2 - 16x + 9 \\ x+1 \overline{) 6x^3 - 10x^2 - 7x - 15} \\ \underline{-(6x^3 + 6x^2)} \\ -16x^2 - 7x \\ \underline{-(-16x^2 - 16x)} \\ +9x - 15 \\ \underline{-(+9x + 9)} \\ -24 \end{array}
 \end{array}$$

$$\begin{aligned}
 (6x^3 - 10x^2 - 7x - 15) \div (x+1) &= 6x^2 - 16x + 9 + \frac{(-24)}{x+1} \\
 &= 6x^2 - 16x + 9 - \frac{24}{x+1}
 \end{aligned}$$

$$\begin{array}{r}
 18) \quad \begin{array}{r} 3x^2 - 2x + \frac{16}{3} \\ 3x-1 \overline{) 9x^3 - 9x^2 + 18x + 5} \\ \underline{-(9x^3 - 3x^2)} \\ -6x^2 + 18x \\ \underline{-(-6x^2 + 2x)} \\ +16x + 5 \\ \underline{-(+16x - \frac{16}{3})} \\ +\frac{31}{3} \end{array}
 \end{array}$$

$$\begin{aligned}
 (9x^3 - 9x^2 + 18x + 5) \div (3x-1) &= 3x^2 - 2x + \frac{16}{3} + \frac{(\frac{31}{3})}{3x-1} \\
 &= 3x^2 - 2x + \frac{16}{3} + \frac{\frac{31}{3}}{3x-1} \\
 &= 3x^2 - 2x + \frac{16}{3} + \frac{31}{3(3x-1)}
 \end{aligned}$$

$$\begin{array}{r}
 20) \quad \begin{array}{r} -3x^2 - 4x - 6 \\ 2x-3 \overline{) -6x^3 + x^2 + 0x - 4} \\ \underline{-(-6x^3 + 9x^2)} \\ -8x^2 + 0x \\ \underline{-(-8x^2 + 12x)} \\ -12x - 4 \\ \underline{-(-12x + 18)} \\ -22 \end{array}
 \end{array}$$

$$\begin{aligned}
 (-6x^3 + x^2 - 4) \div (2x-3) &= -3x^2 - 4x - 6 + \frac{(-22)}{2x-3} \\
 &= -3x^2 - 4x - 6 - \frac{22}{2x-3}
 \end{aligned}$$

22)

$$\begin{array}{r}
 3x^2 - 11x + 24 \\
 x+2 \overline{) 3x^3 - 5x^2 + 2x + 3} \\
 \underline{-(3x^3 + 6x^2)} \\
 -11x^2 + 2x \\
 \underline{-(-11x^2 - 22x)} \\
 +24x + 3 \\
 \underline{-(+24x + 48)} \\
 -45
 \end{array}$$

$$\begin{aligned}
 (3x^3 - 5x^2 + 2x + 3) \div (x+2) &= 3x^2 - 11x + 24 + \frac{(-45)}{x+2} \\
 &= 3x^2 - 11x + 24 - \frac{45}{x+2}
 \end{aligned}$$

24)

$$\begin{array}{r}
 x^2 - 2x + 1 \\
 x+2 \overline{) x^3 + 0x^2 - 3x + 2} \\
 \underline{-(x^3 + 2x^2)} \\
 -2x^2 - 3x \\
 \underline{-(-2x^2 - 4x)} \\
 +x + 2 \\
 \underline{-(+x + 2)} \\
 0
 \end{array}$$

$$\begin{aligned}
 (x^3 - 3x + 2) \div (x+2) &= x^2 - 2x + 1 + \frac{(0)}{x+2} \\
 &= x^2 - 2x + 1
 \end{aligned}$$

26)

$$\begin{array}{r}
 x^2 - 20x + 175 \\
 x+5 \overline{) x^3 - 15x^2 + 75x - 125} \\
 \underline{-(x^3 + 5x^2)} \\
 -20x^2 + 75x \\
 \underline{-(-20x^2 - 100x)} \\
 +175x - 125 \\
 \underline{-(+175x + 875)} \\
 -1000
 \end{array}$$

$$\begin{aligned}
 (x^3 - 15x^2 + 75x - 125) \div (x+5) &= x^2 - 20x + 175 + \frac{(-1000)}{x+5} \\
 &= x^2 - 20x + 175 - \frac{1000}{x+5}
 \end{aligned}$$

28)

$$\begin{array}{r}
 2x^2 - 3x + \frac{8}{3} \\
 3x+1 \overline{) 6x^3 - x^2 + 5x + 2} \\
 \underline{-(6x^3 + 2x^2)} \\
 -3x^2 + 5x \\
 \underline{-(-3x^2 - 3x)} \\
 +8x + 2 \\
 \underline{-(+8x + \frac{8}{3})} \\
 -\frac{2}{3}
 \end{array}$$

$$\begin{aligned}
 (6x^3 - x^2 + 5x + 2) \div (3x+1) &= 2x^2 - 3x + \frac{8}{3} + \frac{(-\frac{2}{3})}{3x+1} \\
 &= 2x^2 - 3x + \frac{8}{3} - \frac{\frac{2}{3}}{3x+1} \\
 &= 2x^2 - 3x + \frac{8}{3} - \frac{2}{3(3x+1)}
 \end{aligned}$$

30)

$$\begin{array}{r}
 x^3 + x^2 - 2x - 2 \\
 x-1 \overline{) x^4 + 0x^3 - 3x^2 + 0x + 1} \\
 \underline{-(x^4 - x^3)} \\
 +x^3 - 3x^2 \\
 \underline{-(+x^3 - x^2)} \\
 -2x^2 + 0x \\
 \underline{-(-2x^2 + 2x)} \\
 -2x + 1 \\
 \underline{-(-2x + 2)} \\
 -1
 \end{array}$$

$$\begin{aligned}
 (x^4 - 3x^2 + 1) \div (x-1) &= x^3 + x^2 - 2x - 2 + \frac{(-1)}{x-1} \\
 &= x^3 + x^2 - 2x - 2 - \frac{1}{x-1}
 \end{aligned}$$

32)

$$\begin{array}{r}
 x^3 - 8x^2 + 21x - 18 \\
 x-2 \overline{) x^4 - 10x^3 + 37x^2 - 60x + 36} \\
 \underline{-(x^4 - 2x^3)} \\
 -8x^3 + 39x^2 \\
 \underline{-(-8x^3 + 16x^2)} \\
 +21x^2 - 60x \\
 \underline{-(+21x^2 - 42x)} \\
 -18x + 36 \\
 \underline{-(-18x + 36)} \\
 0
 \end{array}$$

$$(x^4 - 10x^3 + 37x^2 - 60x + 36) \div (x-2) = x^3 - 8x^2 + 21x - 18$$

34)

$$\begin{array}{r}
 x^3 - 3x + 2 \\
 x+5 \overline{) x^4 + 5x^3 - 3x^2 - 13x + 10} \\
 \underline{-(x^4 + 5x^3)} \\
 +0x^3 - 3x^2 - 13x + 10 \\
 \text{skip} \rightarrow \underline{-(-3x^2 - 15x)} \\
 +2x + 10 \\
 \underline{(+2x + 10)} \\
 0
 \end{array}$$

$$(x^4 + 5x^3 - 3x^2 - 13x + 10) \div (x+5) = x^3 - 3x + 2$$

36)

$$\begin{array}{r}
 2x^3 - 2 \\
 2x-1 \overline{) 4x^4 - 2x^3 - 4x + 2} \\
 \underline{-(4x^4 - 2x^3)} \\
 +0x^3 - 4x + 2 \\
 \text{skip} \rightarrow \underline{-(-4x + 2)} \\
 0
 \end{array}$$

$$(4x^4 - 2x^3 - 4x + 2) \div (2x-1) = 2x^3 - 2$$

38)

$$\begin{array}{r}
 4x^2 + 5x + 2 \\
 x-2 \overline{) 4x^3 - 3x^2 - 8x + 4} \\
 \underline{-(4x^3 - 8x^2)} \\
 +5x^2 - 8x + 4 \\
 \underline{-(+5x^2 - 10x)} \\
 +2x + 4 \\
 \underline{(+2x - 4)} \\
 +8
 \end{array}$$

remainder: +8

 $(x-2)$ is not a factor of

$$(4x^2 + 5x + 2)$$

40)

$$\begin{array}{r}
 -4x^2 + 19x - 51 \\
 x+3 \overline{) -4x^3 + 5x^2 + 0x + 8} \\
 \underline{-(-4x^3 - 12x^2)} \\
 +17x^2 + 0x + 8 \\
 \underline{-(+17x^2 + 51x)} \\
 -51x + 8 \\
 \underline{-(-51x - 153)} \\
 +153
 \end{array}$$

remainder: +153

 $(x+3)$ is not a factor of

$$(-4x^3 + 5x^2 + 8)$$

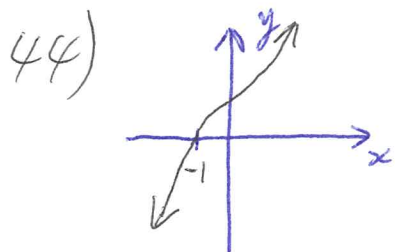
42)

$$\begin{array}{r}
 2x^3 + 2 \\
 x - \frac{1}{2} \overline{) 2x^4 - x^3 + 2x - 1} \\
 \underline{-(2x^4 - x^3)} \\
 +0x^3 + 2x - 1 \\
 \underline{-(+2x - 1)} \\
 0
 \end{array}$$

skip $\rightarrow$

remainder: 0
 $(x - \frac{1}{2})$ is a factor of $(2x^4 - x^3 + 2x - 1)$

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

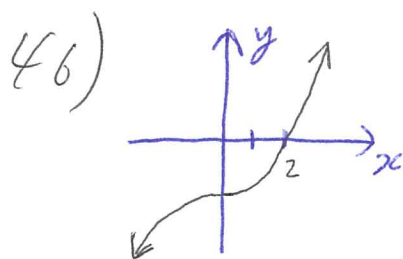


linear root (x-int): $x = -1 \rightarrow (x + 1) = 0$

factor: $x^2 - x - 3$

$$y = (x + 1)(x^2 - x - 3) = x^3 - x^2 - 3x + x^2 - x - 3$$

$$y = x^3 - 2x - 3$$

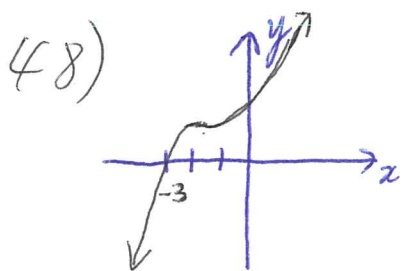


linear root (x-int): $x = 2 \rightarrow (x - 2) = 0$

factor: $x^2 + 2x + 5$

$$y = (x - 2)(x^2 + 2x + 5) = x^3 + 2x^2 + 5x - 2x^2 - 4x - 10$$

$$y = x^3 + x - 10$$



linear root (x-int): $x = -3 \rightarrow (x + 3) = 0$

factor: $x^2 + 2x + 2$

$$y = (x + 3)(x^2 + 2x + 2) = x^3 + 2x^2 + 2x + 3x^2 + 6x + 6$$

$$y = x^3 + 5x^2 + 8x + 6$$

50)

$$\begin{array}{r}
 2x^2 - 6x + 18 \\
 x + 3 \overline{) 2x^3 + 0x^2 + 0x + 25} \\
 \underline{-(2x^3 + 6x^2)} \\
 -6x^2 + 0x \\
 \underline{-(-6x^2 - 18x)} \\
 +18x + 25 \\
 \underline{-(+18x + 54)} \\
 -29
 \end{array}$$

$$\frac{2x^3 + 25}{x + 3} = 2x^2 - 6x + 18 + \frac{(-29)}{x + 3}$$

$$= 2x^2 - 6x + 18 - \frac{29}{x + 3}$$

52)

$$\begin{array}{r}
 -4x^2 + 15x - 60 \\
 x+4 \overline{) -4x^3 - x^2 + 0x - 12} \\
 \underline{-(-4x^3 - 16x^2)} \\
 +15x^2 + 0x \\
 \underline{-(+15x^2 + 60x)} \\
 -60x - 12 \\
 \underline{-(-60x - 240)} \\
 +228
 \end{array}$$

$$\frac{-4x^3 - x^2 - 12}{x+4} = -4x^2 + 15x - 60 + \frac{(+228)}{x+4}$$

$$= -4x^2 + 15x - 60 + \frac{228}{x+4}$$