Section 5.5 Addition and Subtraction of Polynomials

Section 5.5 Practice Exercises

1. **(a)** polynomial

(b) coefficient; degree

(c) 1

(d) one

(e) binomial

(f) trinomial

(g) leading; leading coefficient

(h) greatest

(i) zero

3. $(3x)^2(5x^{-4})$

$= 9\cdot 5\cdot x^2\cdot x^{-4}$

$= 45x^{-2}$

$= \dfrac{45}{x^2}$

5. $\dfrac{8t^{-6}}{4t^{-2}} = 2t^{-6-(-2)}$

$= 2t^{-4} = \dfrac{2}{t^4}$

7. $\dfrac{3^4\cdot 3^{-8}}{3^{12}\cdot 3^{-4}} = \dfrac{3^{-4}}{3^8} = 3^{-4-8}$

$= 3^{-12} = \dfrac{1}{3^{12}}$

9. 4×10^{-2} is in scientific notation in which 10 is raised to the negative 2 power. 4^{-2} is not in scientific notation and 4 is being raised to the negative 2 power.

11. **(a)** To write the polynomial in descending order, start with term with the highest power;

$-7x^5 + 7x^2 + 9x + 6$

(b) leading coefficient: –7

(c) degree: 5

13. Binomial; $10x^2+5x$

$=10(-3)^2+5(-3)$

$=10(9)+5(-3)$

$=90-15$

$=75$

15. Monomial; $6x^2$

$=6(-3)^2$

$=6(9)$

$=54$

17. Binomial; $2y-y^4$

$=2(2)-(2)^4$

$=2(2)-(16)$

$=4-16$

$=-12$

19. Trinomial; $2y^4-3y+1$

$=2(2)^4-3(2)+1$

$=2(16)+3(2)+1$

$=32-6+1$

$=27$

21. Monomial;

$-32xyz$

$=-32(-3)(2)(-1)$

$=-192$

23. The exponents on the *x*-factors are different.

25. $23x^2y+12x^2y$

$=35x^2y$

27. $3b^5d^2+(5b^5d^2-9d)$

$=3b^5d^2+5b^5d^2-9d$

$=8b^5d^2-9d$

29. $(7y^2+2y-9)+(-3y^2-y)$

$=7y^2-3y^2-y+2y-9$

$=4y^2+y-9$

31. $\left(5x+3x^2-x^3\right)+\left(2x^2+4x-10\right)$

$=-x^3+3x^2+2x^2+5x+4x-10$

$=-x^3+5x^2+9y-10$

33. $(6.1y+3.2x)+(4.8y-3.2x)$

$=6.1y+4.8y+3.2x-3.2x$

$=10.9y$

35.

$$\begin{array}{rl} & 6a+2b-5c \\ + & \underline{-2a-2b-3c} \\ & 4a \qquad -8c \end{array}$$

37. $\left(\frac{2}{5}a+\frac{1}{4}b-\frac{5}{6}\right)+\left(\frac{3}{5}a-\frac{3}{4}b-\frac{7}{6}\right)$

$=\frac{2}{5}a+\frac{3}{5}a+\frac{1}{4}b-\frac{3}{4}b-\frac{5}{6}-\frac{7}{6}$

$=a-\frac{1}{2}b-2$

39. $\left(z-\frac{8}{3}\right)+\left(\frac{4}{3}z^2-z+1\right)$

$=\frac{4}{3}z^2+z-z-\frac{8}{3}+1$

$=\frac{4}{3}z^2-\frac{5}{3}$

41.

$$\begin{array}{rl} & 7.9t^3 \qquad\qquad +2.6t-1.1 \\ + & \underline{\qquad -3.4t^2+3.4t-3.1} \\ & 7.9t^3-3.4t^2+\ \ 6t-4.2 \end{array}$$

43. $-(4h-5)=-4h+5$

45. $-(-2.3m^2+3.1m-1.5)$

$=2.3m^2-3.1m+1.5$

47. $-(3v^3+5v^2+10v+22)$

$=-3v^3-5v^2-10v-22$

49. $4a^3b^2-12a^3b^2=-8a^3b^2$

51. $-32x^3-21x^3=-53x^3$

53. $(7a-7)-(12a-4)=7a-7-12a+4$

$=-5a-3$

55. $(4k+3)-(-12k-6)=4k+3+12k+6$

$=16k+9$

57. $25m^4-(23m^4+14m)$

$=25m^4-23m^4-14m=2m^4-14m$

59. $(5s^2-3st-2t^2)-(2s^2+st+t^2)$
$=5s^2-2s^2-3st-st-2t^2-t^2$
$=3s^2-4st-3t^2$

61. To subtract the polynomials vertically, add the opposite of the second polynomial to the first.

$$\begin{array}{rr} & 10r-6s+2t \\ + & \underline{-12r+3s+\ t} \\ & -2r-3s+3t \end{array}$$

63. $\left(\frac{7}{8}x+\frac{2}{3}y-\frac{3}{10}\right)-\left(\frac{1}{8}x+\frac{1}{3}y\right)$
$=\frac{7}{8}x-\frac{1}{8}x+\frac{2}{3}y-\frac{1}{3}y-\frac{3}{10}$
$=\frac{3}{4}x+\frac{1}{3}y-\frac{3}{10}$

65. $\left(\frac{2}{3}h^2-\frac{1}{5}h-\frac{3}{4}\right)-\left(\frac{4}{3}h^2-\frac{4}{5}h+\frac{7}{4}\right)$
$=\frac{2}{3}h^2-\frac{4}{3}h^2-\frac{1}{5}h+\frac{4}{5}h-\frac{7}{4}-\frac{3}{4}$
$=-\frac{2}{3}h^2+\frac{3}{5}h-\frac{5}{2}$

67. To subtract the polynomials vertically, add the opposite of the second polynomial to the first.

$$\begin{array}{rr} & 4.5x^4-3.1x^2 \qquad\qquad -6.7 \\ + & \underline{-2.1x^4 \qquad\qquad -4.4x\ \ -1.2} \\ & 2.4x^4-\ 3.1x^2-4.4x-7.9 \end{array}$$

69. $(4b^3+6b-7)-(-12b^2+11b+5)$
$=4b^3+12b^2+6b-11b-7-5$
$=4b^3+12b^2-5b-12$

71. $(-2x^2-11)-(\frac{3}{2}x^2-5x)$
$=-2x^2-\frac{3}{2}x^2+5x-11$
$=\frac{1}{2}x^2+5x-11$

73. $(y^2+3)+(3y^3-y^2-1)+(y^3+2y^2)$
$=3y^3+y^3+y^2-y^2+2y^2+3-1$
$=4y^3+2y^2+2$

75. $P=5a^2-2a+1$
$\begin{pmatrix}\text{missing}\\ \text{side}\end{pmatrix}+(a-3)+(2a^2-1)=P$
$\begin{pmatrix}\text{missing}\\ \text{side}\end{pmatrix}=5a^2-2a+1-(a-3)-(2a^2-1)$
$\begin{pmatrix}\text{missing}\\ \text{side}\end{pmatrix}=3a^2-3a+5$

77. $(2ab^2+9a^2b)+(7ab^2-3ab+7a^2b)$
$=2ab^2+7ab^2+9a^2b+7a^2b-3ab$
$=9ab^2-3ab+16a^2b$

79. To subtract the polynomials vertically, add the opposite of the second polynomial to the first.

$$\begin{array}{rr} & 4z^5 \qquad +\ z^3-3z+13 \\ + & \underline{z^4+8z^3 \qquad -15} \\ & 4z^5+z^4+9z^3-3z-2 \end{array}$$

81. $(9x^4+2x^3-x+5)+(9x^3-3x^2+8x+3)$
$-(7x^4-x+12)$
$=9x^4-7x^4+2x^3+9x^3-3x^2-x+x$
$+8x+5+3-12$
$=2x^4+11x^3-3x^2+8x-4$

83. $(0.2w^2+3w+1.3)-(w^3-0.7w+2)$
$=-w^3+0.2w^2+3w+0.7w+1.3-2$
$=-w^3+0.2w^2+3.7w+0.7$

85. $(7p^2q-3pq^2)-(8p^2q+pq)$
$+(4pq-pq^2)$
$=7p^2q-3pq^2-8p^2q-pq$
$+4pq-pq^2$
$=-p^2q-4pq^2+3pq$

87. $(5x-2x^3)+(2x^3-5x)$

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

$=0$

89. To subtract the polynomials vertically, add the opposite of the second polynomial to the first.

$$\begin{array}{rr} & 2a^2b-4ab+ab^2 \\ + & \underline{-2a^2b-ab+5ab^2} \\ & -5ab+6ab^2 \end{array}$$

91. $[(3y^2-5y)-(2y^2+y-1)]$
$+(10y^2-4y-5)$

$=(3y^2-2y^2-5y-y+1)$
$+(10y^2-4y-5)$

$=y^2-6y+1+10y^2-4y-5$

$=y^2+10y^2-6y-4y+1-5$

$=11y^2-10y-4$

93. Answers will vary;

x^3+6

95. Answers will vary; $8x^5$

97. Answers will vary;

$-6x^2+2x+5$