Polynomials and Polynomial Functions - ANSWERS

P1 Exercises

1. yes **3.** no **5.** 4; 1 **7.** 2; $\sqrt{2}$

9. $-\frac{2}{5}x^3 + 3x^2 - x + 5$; 3; $-\frac{2}{5}$ **11.** $x^5 + 8x^4 + 2x^3 - 3x$; 5; 1

13. $3q^4 + q^2 - 2q + 1$; 4; 3 **15.** first degree binomial

17. zero degree monomial **19.** seventh degree monomial

21. -8 **23.** -12 **25.** -5 **27.** $2a - 3$

29. -21 **31.** $6a - 9$ **33.** $-x + 13y$ **35.** $4xy + 3x$

37. $6p^3 - 3p^2 + p + 2$ **39.** $3m + 11$ **41.** $-x - 4$ **43.** $-5x^2 + 4y^2 - 11z^2$

45. $-4x^2 - 3x - 5$ **47.** $5r^6 - r^5 - 7r^2 + 5$ **49.** $-5a^4 - 6a^3 + 9a^2 - 11$

51. $5x^2y^2 - 7y^3 + 17xy$ **53.** $-z^2 - x + 4m$ **55.** $10z^2 - 16z$

57. **a.** $(f + g)(x) = 8x - 8$ **b.** $(f - g)(x) = 2x - 4$

59. **a.** $(f + g)(x) = -2x^2 - 3x + 1$ **b.** $(f - g)(x) = 8x^2 - 7x - 1$

61. **a.** $(f + g)(x) = -6x^{2n} - 2x^n - 1$ **b.** $(f - g)(x) = 10x^{2n} - 4x^n + 7$

63. $(P - Q)(-2) = -1$ **65.** $(R - Q)(0) = -7$ **67.** $(P + Q)(a) = a^2 + 2a + 1$

69. $(P + R)(2k) = 4k^2 + 2k - 6$ **71.** ~9.3 cm

73. **a.** $R(n) = 56n$ **b.** $P(n) = 24n - 1500$ **c.** $P(100) = 900$;
The profit from selling 100 dresses is \$900.

P2 Exercises

1. **a.** no; $x^2 \cdot x^4 = x^6$ **b.** no; $-2x^2$ is in the simplest form **c.** yes **d.** yes **e.** no; $(a^2)^3 = a^6$
f. no; $4^5 \cdot 4^2 = 4^7$ **g.** no; $\frac{6^5}{3^2} = 2^5 \cdot 3^3$ **h.** no; $xy^0 = x$ **i.** yes

3. $-8y^8$ **5.** $14x^3y^8$ **7.** $-27x^6y^3$ **9.** $\frac{-5x^3}{y^2}$

11. $\frac{64a^6}{b^3}$ **13.** $\frac{-125p^3}{q^9}$ **15.** $12a^5b^5$ **17.** $\frac{16y}{x^3}$

19. $64x^{18}y^6$ **21.** x^{2n-1} **23.** 5^{2ab} **25.** $-2x^2$

27. $x^{a^2-b^2}$ **29.** $-16x^7y^4$ **31.** $-6x^2+10x$ **33.** $-12x^5y+9x^4y^2$

35. $15k^4-10k^3+20k^2$ **37.** x^2+x-30 **39.** $6x^2+5x-6$

41. $6u^4-8u^3-30u^2$ **43.** $6x^3-7x^2-13x+15$

45. $6m^4-13m^2n^2+5n^4$ **47.** a^2-4b^2 **49.** $a^2-4ab+4b^2$

51. y^3+27 **53.** $2x^4-4x^3y-x^2y^2+3xy^3-2y^4$ **55.** true

57. true **59.** false; $(2-1)^3 \neq 2^3-1^3$ **61.** $25x^2-16$

63. $\frac{1}{4}x^2-9y^2$ **65.** x^4-49y^6 **67.** $0.64a^2+0.32ab+0.04b^2$

69. x^2-6x+9 **71.** $25x^2-60xy+36y^2$ **73.** $4n^2-\frac{4}{3}n+\frac{1}{9}$

75. $x^8y^4+6x^4y^2+9$ **77.** $4x^4-12x^2y^3+9y^6$

79. $8a^5+40a^4b+50a^3b^2$ **81.** $x^4-x^2y^2$

83. x^4-1 **85.** $a^4-2a^2b^2+b^4$ **87.** $4x^2+12xy+9y^2-25$

89. $4k^2-12k+4hk-6h+h^2+9$ **91.** $x^{4a}-y^{4b}$

93. $101\cdot 99=(100+1)(100-1)=10000-1=9999$

95. $505\cdot 495=(500+5)(500-5)=250000-25=249975$

97. x^2-x-12 **99.** $(fg)(x)=15x^2-28x+12$

101. $(fg)(x)=-3x^4+8x^3+22x^2-45x$ **103.** $(PR)(x)=x^3-2x^2-4x+8$

105. $(PQ)(a)=2a^3-8a$ **107.** $(PQ)(3)=30$

109. $(QR)(x)=2x^2-4x$ **111.** $(QR)(a+1)=2a^2-2$

113. $P(2a+3)=4a^2+12a+5$ **115.** $4x^3-240x^2+3500x$

P3 Exercises

1. False; When dividing powers with the same bases, we subtract exponents. So, the quotient will be a fourth-degree polynomial.

3. $4x^2-3x+1$ **5.** $2xy-6$ **7.** $-3a^3+5a^2-4a$ **9.** $8-\frac{9}{x}+\frac{3}{2x^2}$

11. $\frac{2b}{a}+\frac{5}{3}+\frac{3c}{a}$ **13.** Long; $y+5$ **15.** Synthetic; $t-4$ R -21

17. Long; $2a^2-a+2$ R 6 **19.** Long; $2z^2-4z+1$ R -10

21. Long; $3x+1$ R $-3x-7$ **23.** Long; $3k^2+4k+1$

25. Long; $\frac{5}{4}t+1$ R -5 **27.** Synthetic; p^2+p+1

29. Synthetic; y^3-2y^2+4y-8 R 32 **31.** $Q(x)=2x^2-x+6$; $R(x)=4$

33. $\left(\frac{f}{g}\right)(x)=3x-2$; $D_{\frac{f}{g}}=\mathbb{R}\setminus\{0\}$ **35.** $\left(\frac{f}{g}\right)(x)=x-6$; $D_{\frac{f}{g}}=\mathbb{R}\setminus\{-6\}$

37. $\left(\frac{f}{g}\right)(x)=x+1$; $D_{\frac{f}{g}}=\mathbb{R}\setminus\left\{\frac{3}{2}\right\}$ **39.** $\left(\frac{f}{g}\right)(x)=4x^2-10x+25$; $D_{\frac{f}{g}}=\mathbb{R}\setminus\left\{-\frac{5}{2}\right\}$

41. $\left(\frac{R}{Q}\right)(x)=\frac{x-2}{2x}$ **43.** $\left(\frac{R}{P}\right)(x)=\frac{1}{x+2}$, $x\neq 2$ **45.** $\left(\frac{R}{Q}\right)(0)=DNE$

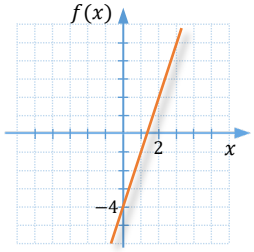
47. $\left(\frac{R}{P}\right)(-2)=DNE$ **49.** $\left(\frac{P}{R}\right)(a)=a+2$ **51.** $\frac{1}{2}\left(\frac{Q}{R}\right)(x)=\frac{x}{x-2}$

53. **a.** $L=3x-2$ **b.** 10 m

P4 Exercises

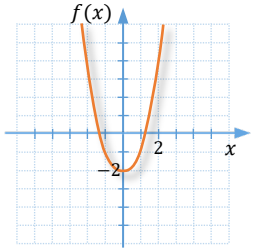
1. False; it's the shape of a basic parabola with a vertex at $(\mathbf{0},\mathbf{3})$.

3.



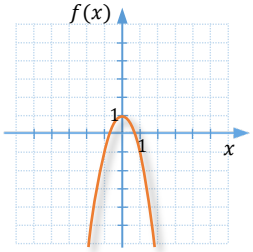
Domain: $\mathbb{R}$
Range: $\mathbb{R}$

5.



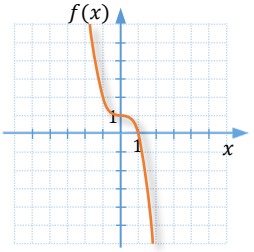
Domain: $\mathbb{R}$
Range: $[-2,\infty)$

7.



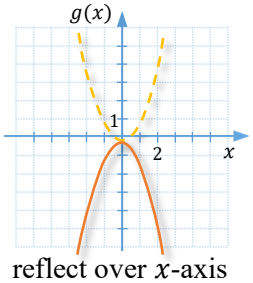
Domain: $\mathbb{R}$
Range: $(-\infty,1]$

9.



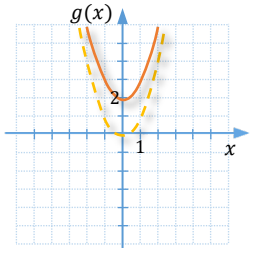
Domain: $\mathbb{R}$
Range: $\mathbb{R}$

11.



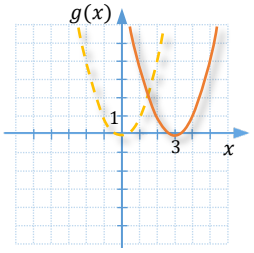
reflect over x-axis

13.



translation: 2 up

15.



translation: 3 to the right