

Polynomials and Polynomial Functions - ANSWERS

P.1 Exercises

1. monomials
3. binomial
5. leading
7. like
9. yes
11. no
13. 4; 1
15. 2; $\sqrt{2}$
17. $-\frac{2}{5}x^3 + 3x^2 - x + 5$; 3; $-\frac{2}{5}$
19. $x^5 + 8x^4 + 2x^3 - 3x$; 5; 1
21. $3q^4 + q^2 - 2q + 1$; 4; 3
23. first degree binomial
25. zero degree monomial
27. seventh degree monomial
29. -8
31. -12
33. -5
35. $2a - 3$
37. -21
39. $6a - 9$
41. $-x + 13y$
43. $4xy + 3x$
45. $6p^3 - 3p^2 + p + 2$
47. $3m + 11$
49. $-x - 4$
51. $-5x^2 + 4y^2 - 11z^2$
53. $-4x^2 - 3x - 5$
55. $5r^6 - r^5 - 7r^2 + 5$
57. $-5a^4 - 6a^3 + 9a^2 - 11$
59. $5x^2y^2 - 7y^3 + 17xy$
61. $-z^2 + x + 4m$
63. $10z^2 - 16z$
65. Yes. Example: $P(x) = x^3 + x^2$, $Q(x) = -x^3 + 1$
67. a. $(f + g)(x) = x^2 + 13x + 3$ b. $(f - g)(x) = x^2 + x - 7$
69. a. $(f + g)(x) = 7x^n - 2x - 7$ b. $(f - g)(x) = -3x^n - 4x + 5$
71. $(P + R)(-1) = -6$ 73. $(Q - R)(3) = 10$ 75. $(R - Q)(k) = -k - 7$
77. $(Q - R)(a + 1) = a + 8$ 79. $N(t) = -0.42t^2 + 5.34t + 28$
81. $(1 + \pi)x^2$; 414 cm^2

P.2 Exercises

1. add
3. multiply
5. binomials
7. perfect
9. $15x^5$
11. $-15x^8$
13. $-18t^7s^6$
15. $\frac{3x^2}{y}$
17. $4x^{10}y^6$
19. $\frac{9m^8}{n^6}$
21. $-15a^7$
23. $\frac{2p}{3q}$
25. $\frac{-1}{6^3x^6y^3}$
27. $-a^{30}b^{60}$
29. $3a^{n+1}$
31. 7^{12xy}

33. $-5x^{2b}$ 35. $x^{2n}y^n$ 37. $-15a^5b^9$ 39. $-24y^2 + 4y$
41. $-12a^3b^2 - 30a^4b$ 43. $12p^5 + 30p^4 - 18$ 45. $x^2 - 4x - 21$
47. $45p^3 + 39p^2 + 6p$ 49. $2t^3 - 5t^2 - 16t - 6$
51. $a^4 - 5a^2b^2 + 6b^4$ 53. $x^2 - 25$ 55. $x^2 + 8x + 16$ 57. $x^3 - 64$
59. $x^4 - x^3 - x^2 + 7x - 6$ 61. false; $(1 + 1)^2 \neq 1^2 + 1^2$
63. false; $(1 - 1)^2 \neq 1^2 + 1^2$ 65. false: $(1 - 1)^2 \neq 1^2 + 1 \cdot 1 + 1^2$
67. $4p^2 - 9$ 69. $b^2 - \frac{1}{9}$ 71. $4x^2y^2 - 25y^6$ 73. $1.21x^2 - 0.25y^2$
75. $x^2 + 12x + 36$ 77. $16x^2 + 24xy + 9y^2$ 79. $9a^2 + 3a + \frac{1}{4}$ 81. $a^6b^4 - 2a^3b^2 + 1$
83. $9a^4 + 24a^2b^3 + 16b^6$ 85. $75x^2y^7 - 12y$
87. $3x^5y^2 - 6x^4y^4 + 3x^3y^6$ 89. $16p^4 - 9p^2q^2$ 91. $16x^4 - y^4$
93. $a^2 + 2ab + b^2 - 1$ 95. $81m^4 - 36m^2n^2 + 16n^4$
97. $16x^2 + 8xy + y^2 - 25$ 99. $x^{4a} - 2x^{2a}y^{2b} + y^{4b}$
101. $198 \cdot 202 = (200 - 2)(200 + 2) = 40000 - 4 = 39996$
103. $2x^2 - 7x - 15$ 105. $5x^2 - 6x + 1$
107. $(fg)(x) = 6x^3 + 47x^2 + 23x - 10$ 109. $(fg)(x) = x^{2n} - 3x^n - 4$
111. $(PQ)(x) = 2x^3 - 8x$ 113. $(PR)(-1) = 9$
115. $(PR)(0) = 8$ 117. $(QR)\left(\frac{1}{2}\right) = -\frac{3}{2}$
119. $P(a - 1) = a^2 - 2a - 5$ 121. $P(1 + h) - P(1) = h^2 + 2h$
123. $-x^2 + 50x$

P.3 Exercises

1. decreasing; zero 3. monomial 5. domain 7. false
9. $4x^2 - 3x + 1$ 11. $2xy - 6$ 13. $-3a^3 + 5a^2 - 4a$ 15. $8 - \frac{9}{x} + \frac{3}{2x^2}$
17. $\frac{2b}{a} + \frac{5}{3} + \frac{3c}{a}$ 19. $y + 5$ 21. $t - 4$ R - 21
23. $2a^2 - a + 2$ R 6 25. $2z^2 - 4z + 1$ R - 10 27. $3x + 1$ R - $3x - 7$
29. $3k^2 + 4k + 1$ 31. $\frac{5}{4}t + 1$ R - 5 33. $p^2 + p + 1$

35. $y^3 - 2y^2 + 4y - 8$ R 32

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

43. $\left(\frac{f}{g}\right)(x) = x + 1$; $D_{\frac{f}{g}} = \mathbb{R} \setminus \left\{\frac{3}{2}\right\}$

47. $\left(\frac{R}{Q}\right)(x) = \frac{x-2}{2x}$

49. $\left(\frac{R}{P}\right)(x) = \frac{1}{x+2}$, $x \neq 2$

51. $\left(\frac{R}{Q}\right)(0) = DNE$

53. $\left(\frac{R}{P}\right)(-2) = DNE$

55. $\left(\frac{P}{R}\right)(a) = a + 2$

57. $\frac{1}{2}\left(\frac{Q}{R}\right)(x) = \frac{x}{x-2}$

59. a. $L = 5x + 2$ b. 42 m

P.4 Exercises

1. composition

3. identity

5. translating; up

7. cubic; right

9. $(f \circ g)(1) = 18$

11. $(g \circ f)(x) = -x^2 + 3$

13. $(f \circ h)(-1) = 27$

15. $(f \circ h)(x) = 4x^2 - 12x + 11$

17. $(h \circ g)(-2) = 11$

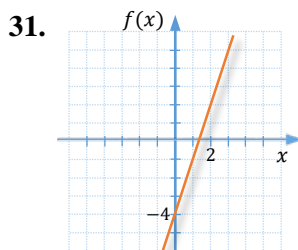
19. $(h \circ g)(x) = -2x + 7$

21. $(f \circ f)(2) = 38$

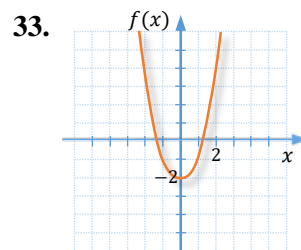
23. $(h \circ h)(x) = 4x - 9$

25. $(g \circ f)(x) = 30.48x$ computes the number of centimeters in x feet

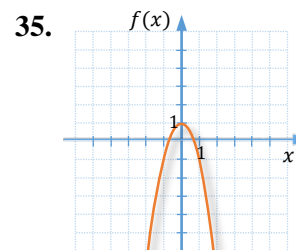
27. a. $s = \frac{x}{4}$ b. $y = \frac{x^2}{16}$ c. $y(6) = \frac{9}{4}$

29. No. It is 32.5% off. To find the new price we use composition of functions $(f \circ g)(x)$ where $f(x) = .75x$ and $g(x) = .9x$. So, the discount is $x - f(g(x)) = x - .9 \cdot .75x = (1 - .675)x = .325x$.

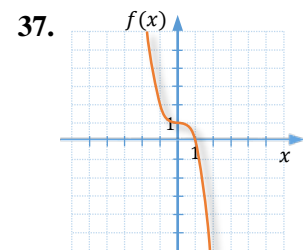
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Range: \mathbb{R}



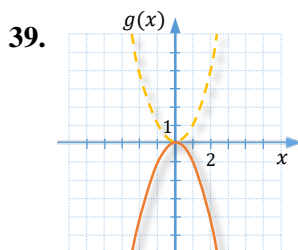
Domain: \mathbb{R}
Range: $[-2, \infty)$



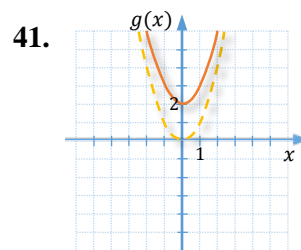
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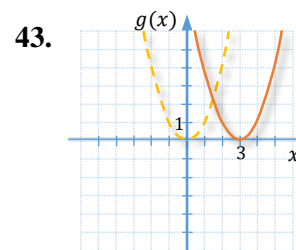
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symmetry in x -axis



translation: 2 up



translation: 3 to the right