

## Chapter 6: Polynomials and Polynomial Functions Date \_\_\_\_\_ Period \_\_\_\_\_

**Simplify. Your answer should contain only positive exponents.**

$$1) \frac{(x^2y^4)^{-3}}{(2x^2 \cdot (yx^{-3})^4)^{-2}}$$

$$2) \frac{2v^{-1}}{(u^3)^4 \cdot (2u^3v^{-3})^{-4}}$$

$$3) \left( \frac{2x^{-2} \cdot yx^3}{x^2y^3} \right)^2$$

$$4) \frac{(2x^4y^4)^{-4}}{2yx^4}$$

$$5) \frac{2u^{-4}}{u^3v^4 \cdot (2u^{-1}v^3)^{-2}}$$

$$6) \frac{(y^2 \cdot 2y)^4}{2y^{-2}}$$

**Simplify each expression.**

$$7) (4k + 2k^4 + 4k^2) - (7k^4 + 3k^2 - k) + (2k^4 - 7k + 3k^3)$$

$$8) (7a^3 + 4a + 5) - (4a^4 - 2 - 7a^3) + (2a^3 - 3a + a^4)$$

$$9) (7x^4 + 7x^3 + 3) + (x^3 + 2x^4 + 2) + (7 - 4x^3 - 3x^4)$$

$$10) (5 + 3r^3 + 2r^2) + (7r^3 + 2 + 5r^2) + (6r^3 + 3r^2 - 1)$$

**Find each product.**

$$11) (7r + 2)(4r + 5)$$

$$12) (7a + 8)(6a + 7)$$

$$13) (5n^2 + 3n + 2)(5n^2 + 6n + 1)$$

$$14) (n^2 + 3n - 8)(5n^2 + 8n - 6)$$

**Divide.**

$$15) (20v^3 + 20v^2 + 3v) \div 10v$$

$$16) (5p^3 + 50p^2 + 50p) \div 10p^2$$

$$17) (3r^3 + 2r^2 + 6r) \div 6r^2$$

$$18) (3b^3 + 2b^2 + 27b) \div 9b^3$$

19)  $(p^3 + 18p^2 + 71p - 96) \div (p + 10)$

20)  $(n^3 - 8n^2 + 15n - 48) \div (n - 7)$

21)  $(m^3 - 3m^2 - 4m + 15) \div (m + 2)$

22)  $(n^3 - 11n^2 + 4n + 54) \div (n - 10)$

**Evaluate each function at the given value.**

23)  $f(x) = x^4 + 3x^3 - 10x^2 - 21x + 23$  at  $x = -4$

24)  $f(a) = -2a^4 - 5a^3 + 14a^2 + 13a + 10$  at  $a = -4$

25)  $f(m) = -4m^3 - 25m^2 - 27m - 8$  at  $m = -5$

26)  $f(m) = m^3 + m^2 - 19m + 10$  at  $m = -5$

**Factor each completely.**

27)  $7n^3 - 2n^2 + 28n - 8$

28)  $15m^3 + 6m^2 - 5m - 2$

29)  $35k^3 - 42k^2 - 30k + 36$

30)  $3x^3 - 21x^2 + x - 7$

31)  $3b^3 - 75b$

32)  $x^3 - 3x^2 - 28x$

33)  $b^2 + 4b - 5$

34)  $a^3 - 12a^2 + 20a$

35)  $x^4 - 15x^3 + 50x^2$

36)  $x^3 - 5x^2 - 14x$

37)  $u^4 + 12u^2 + 32$

38)  $x^4 - 6x^2 - 16$

39)  $5x^4 - 180$

40)  $x^4 - 7x^2 - 18$

41)  $192x^3 + 3$

42)  $864x^3 + 4$

43)  $8x^3 + 1$

44)  $27x^3 + 64$

**Factor each.**

$$45) x^6 + 63x^3 - 64 = 0$$

$$46) x^6 - 1 = 0$$

$$47) x^6 + 5x^4 - 4x^2 - 20 = 0$$

$$48) x^8 - 26x^4 + 25 = 0$$

$$49) x^8 - 13x^4 + 36 = 0$$

$$50) x^8 - 25x^4 + 144 = 0$$

**State the number of complex zeros, the possible number of real and imaginary zeros, and the possible rational zeros for each function. Then find all zeros.**

$$51) f(x) = x^4 + 2x^2 - 3$$

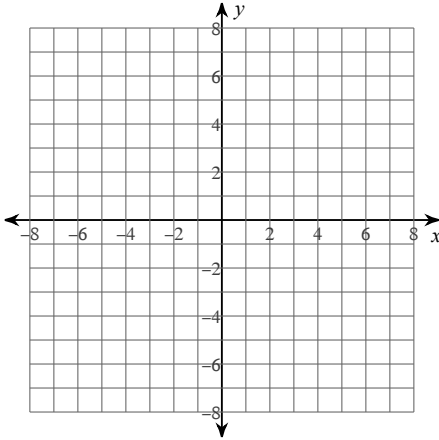
$$52) f(x) = x^3 - 3x^2 + 3x - 9$$

$$53) f(x) = x^4 - 6x^2 - 7$$

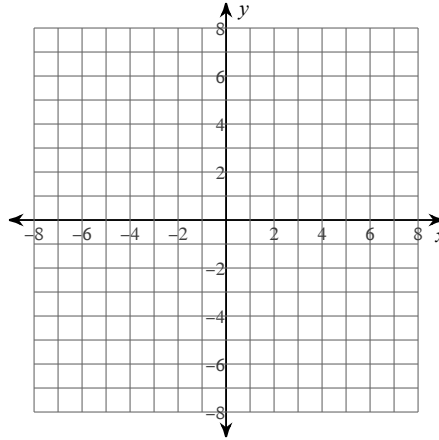
$$54) f(x) = x^5 + 2x^4 + x^3 + 2x^2 - 12x - 24$$

Sketch the graph of each function. You are expected to know the end behavior, and zeros only.

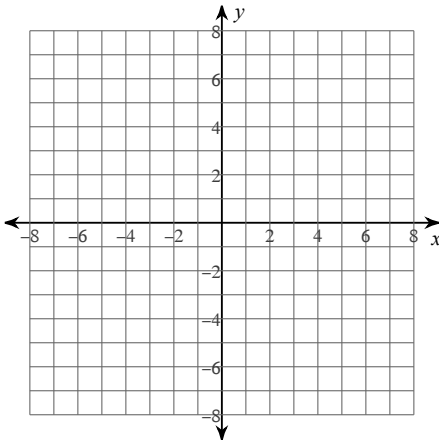
55)  $f(x) = x^4 - 2x^2 - x$



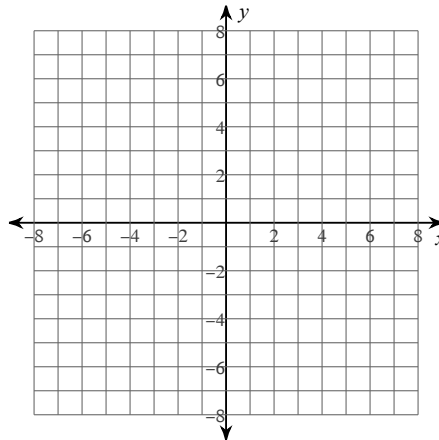
56)  $f(x) = x^3 - 4x^2 + 2$



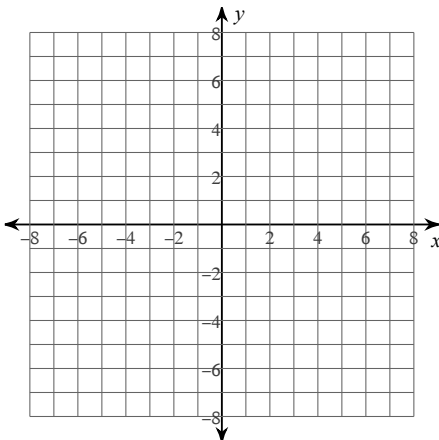
57)  $f(x) = x^4 - 4x^2 + 2x$



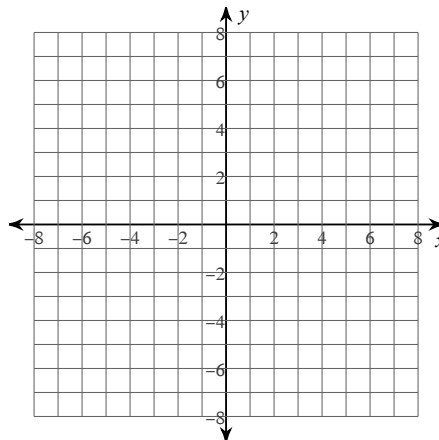
58)  $f(x) = x^3 + 8x^2 + 16x + 3$



59)  $f(x) = x^3 - 8x^2 + 20x - 12$



60)  $f(x) = x^3 - 4x^2 + 6$



# Answers to Chapter 6: Polynomials and Polynomial Functions (ID: 1)

1)  $\frac{4}{x^{26}y^4}$

2)  $\frac{32}{v^{13}}$

3)  $\frac{4}{x^2y^4}$

4)  $\frac{1}{32x^{20}y^{17}}$

5)  $\frac{8v^2}{u^9}$

6)  $8y^{14}$

7)  $-3k^4 + 3k^3 + k^2 - 2k$

8)  $-3a^4 + 16a^3 + a + 7$

9)  $6x^4 + 4x^3 + 12$

10)  $16r^3 + 10r^2 + 6$

11)  $28r^2 + 43r + 10$

12)  $42a^2 + 97a + 56$

13)  $25n^4 + 45n^3 + 33n^2 + 15n + 2$

14)  $5n^4 + 23n^3 - 22n^2 - 82n + 48$

15)  $2v^2 + 2v + \frac{3}{10}$

16)  $\frac{p}{2} + 5 + \frac{5}{p}$

17)  $\frac{r}{2} + \frac{1}{3} + \frac{1}{r}$

18)  $\frac{1}{3} + \frac{2}{9b} + \frac{3}{b^2}$

19)  $p^2 + 8p - 9 - \frac{6}{p+10}$

20)  $n^2 - n + 8 + \frac{8}{n-7}$

21)  $m^2 - 5m + 6 + \frac{3}{m+2}$

22)  $n^2 - n - 6 - \frac{6}{n-10}$

23) 11

24) -10

25) 2

26) 5

27)  $(n^2 + 4)(7n - 2)$

28)  $(3m^2 - 1)(5m + 2)$

29)  $(7k^2 - 6)(5k - 6)$

30)  $(3x^2 + 1)(x - 7)$

31)  $3b(b - 5)(b + 5)$

32)  $x(x - 7)(x + 4)$

33)  $(b - 1)(b + 5)$

34)  $a(a - 2)(a - 10)$

35)  $x^2(x - 5)(x - 10)$

36)  $x(x - 7)(x + 2)$

37)  $(u^2 + 4)(u^2 + 8)$

38)  $(x^2 - 8)(x^2 + 2)$

39)  $5(x^2 - 6)(x^2 + 6)$

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

41)  $3(4x + 1)(16x^2 - 4x + 1)$

42)  $4(6x + 1)(36x^2 - 6x + 1)$

43)  $(2x + 1)(4x^2 - 2x + 1)$

44)  $(3x + 4)(9x^2 - 12x + 16)$

45)  $(x - 1)(x^2 + x + 1)(x + 4)(x^2 - 4x + 16) = 0$

46)  $(x - 1)(x^2 + x + 1)(x + 1)(x^2 - x + 1) = 0$

47)  $(x^2 + 5)(x^2 - 2)(x^2 + 2) = 0$

48)  $(x - 1)(x + 1)(x^2 + 1)(x^2 - 5)(x^2 + 5) = 0$

49)  $(x^2 - 2)(x^2 + 2)(x^2 - 3)(x^2 + 3) = 0$

50)  $(x^2 - 3)(x^2 + 3)(x - 2)(x + 2)(x^2 + 4) = 0$

51) # of complex zeros: 4

Possible # of real zeros: 4, 2, or 0

Possible # of imaginary zeros: 4, 2, or 0

Possible rational zeros:  $\pm 1, \pm 3$

Zeros:  $\{1, -1, i\sqrt{3}, -i\sqrt{3}\}$

52) # of complex zeros: 3

Possible # of real zeros: 3 or 1

Possible # of imaginary zeros: 2 or 0

Possible rational zeros:  $\pm 1, \pm 3, \pm 9$

Zeros:  $\{3, i\sqrt{3}, -i\sqrt{3}\}$

53) # of complex zeros: 4

Possible # of real zeros: 4, 2, or 0

Possible # of imaginary zeros: 4, 2, or 0

Possible rational zeros:  $\pm 1, \pm 7$

Zeros:  $\{i, -i, \sqrt{7}, -\sqrt{7}\}$

54) # of complex zeros: 5

Possible # of real zeros: 5, 3, or 1

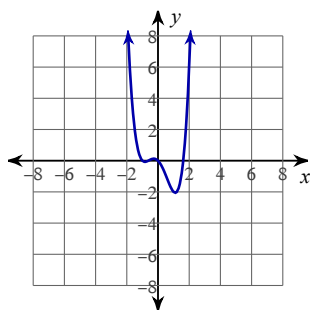
Possible # of imaginary zeros: 4, 2, or 0

Possible rational zeros:

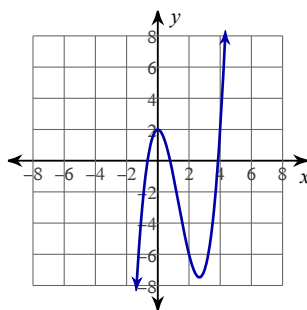
$\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 8, \pm 12, \pm 24$

Zeros:  $\{-2, \sqrt{3}, -\sqrt{3}, 2i, -2i\}$

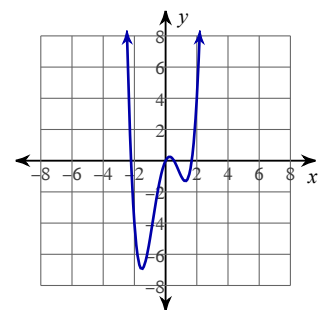
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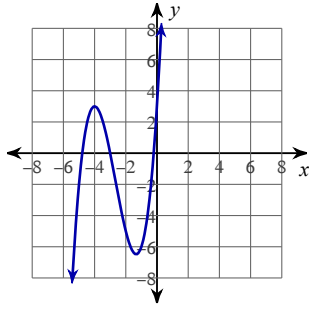
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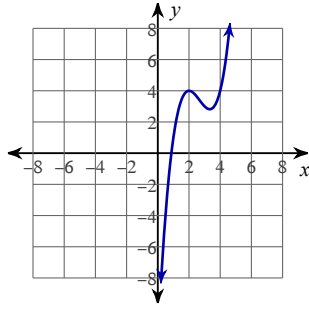
57)



58)



59)



60)

