

4-05 FIND ALL ZEROS OF POLYNOMIAL FUNCTIONS

List all the possible rational zeros.

$$1. f(x) = x^4 + 10x^3 - 2x^2 + 3x - 18$$

$$2. f(x) = 2x^5 + 125x^3 - 1$$

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

$$4. f(x) = 4x^3 + 3x^2 + 5x + 24$$

Mixed Review

Find all the zeros. (You may factor if they are easily factored.)

$$5. f(x) = x^3 - 5x^2 - 2x + 24$$

$$6. f(x) = x^3 + 2x^2 - 13x + 10$$

$$7. f(x) = 2x^3 - x^2 - 2x + 1$$

Find all the zeros. (You may factor if they are easily factored.)

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

$$9. f(x) = 2x^4 + 5x^3 - 5x^2 - 20x - 12$$

$$10. f(x) = x^4 - 16x^3 + 40x - 25$$

$$11. f(x) = 3x^4 + 4x^3 - 13x^2 + 66x - 40$$

Mixed Review

Find all the zeros. (You may factor if they are easily factored.)

$$12. (4-04) Use the remainder theorem to evaluate $f(x) = -2x^4 - 3x^2 + 15$ for $x = -1$.$$

13. (4-03) Simplify $(4x^3 + 8x^2 + x - 1) \div (2x + 1)$.

$$14. (4-02) Factor $x^3 - 3x^2 - 4x + 12$.$$

$$15. (4-01) Simplify $(3x^2 + 1) \div (x^2 - x + 15)$$$

4-REVIEW

Take this test as you would take a test in class. When you are finished, check your work against the answers.

Divide with synthetic division.

$$1. (2x^3 + 7x^2 - 14x + 20) \div (x + 4)$$

$$2. (2x^4 + 3x^2 + 5x - 7) \div (x - 3)$$

4-04

Use the remainder theorem to evaluate $f(x)$ at the given x value.

$$13. (3x^3 - 2x^2 + x + 18; x = 2)$$

$$14. x^4 - 5x^2 + 3x - 20; x = -3$$

Determine whether the given binomial is a factor of $f(x)$. Show work other than graphing.

$$15. f(x) = x^3 - x^2 - 14x + 24; (x + 4)$$

16. $f(x) = 6x^3 + x^2 - 5x - 2; (x - 1)$

17. $x^4 + 2x^2 - 4x + 16$

18. $2x^3 - 71x^2 + 40x - 8$

19. $(6x^3 + 13x^2 + 3x - 2) \div (2x^2 + 3x - 1)$

20. $(9x^3 + 6x^2 - 23x + 10) \div (3x - 2)$

4-01

Answers

1. $x < -3$ or $x > 3$

2. $x = 3$

3. $-1 \pm \sqrt{3}$

CHAPTER 4 PRACTICE EXERCISES (*OPTIONAL)

4-01 ADD, SUBTRACT, AND MULTIPLY POLYNOMIALS

166 #4, 5, 9, 11, 13, 15, 17, 19, 21, 23, 29, 33, 37, Mixed Review = 20

Mixed Review

$$1. (3-07) Solve $x^2 - 9 > 0$.$$

$$2. (3-07) Solve $x^2 - 6x + 9 \leq 0$.$$

$$3. (3-06) Solve by any method $2(x + 1)^2 + 5 = 5$.$$

$$4. (2-04) Graph $f(x) = x^3 - 2x - 3$.$$

$$5. (2-01) Graph $y = x^2 - 4x - 5$.$$

Mixed Review

$$173 #4, 7, 9, 11, 13, 15, 21, 31, Mixed Review = 15$$

Mixed Review

$$3. (4-01) Simplify $(2x - 1)(x + 7)$.$$

$$2. (4-01) Simplify $(2x - 1)(x + 7)$.$$

$$4. (3-06) Solve $x^2 - 5x + 4 = 0$.$$

$$5. (2-04) Graph and find the x -intercepts of $f(x) = 2x^3 - 5x^2 - 28x + 15$.$$

Mixed Review

$$3. (4-01) Simplify $(x + 4)^2$.$$

$$4. (3-05) Solve $0 = x^2 - 3x + 1$.$$

Mixed Review

$$5. (2-02) Write a quadratic function passing through (0, 2) with intercepts (-2, 0) and (-1, 0).$$

Mixed Review

$$6. 4x^3 + 2x^2 + 16x + 8$$

$$5. x^3 + 6x^2 + 5x$$

$$10. (fx) = 3x^4 + 2x^3 - 13x^2 - 8x + 4; (x + 1), (x + 2)$$

Mixed Review

$$11. (4-03) Simplify $(2x^3 + 3x^2 - 4x + 5) \div (x^2 + 3x - 1)$$$

12. (4-03) Simplify $(3x^5 - 5x^3 - x + 4) \div (x - 2)$

Show that the given binomial is a factor of $f(x)$, then find the zeros of $f(x)$.

$$13. (4-02) 2x^2 + 9x + 4 = 0$$

$$14. (4-02) 2x^3 + 2x^2 = 24x$$

$$7. f(x) = x^3 - 19x - 30; (x + 2)$$

$$15. (4-02) x^3 + 2x^2 - 16x - 32 = 0$$

4-02 FACTOR AND SOLVE POLYNOMIAL EQUATIONS

Mixed Review

$$3. (3-07) Solve $x^2 - 16 \leq 0$.$$

Mixed Review

$$4. (3-06) Solve $x^2 - 5x - 4 = 0$.$$

Mixed Review

$$5. (2-04) Graph and find the x -intercepts of $f(x) = 2x^3 - 5x^2 - 28x + 15$.$$

4-03

Divide with long division.

$$1. (2x^2 + 3x - 4)(x^2 - 3x + 1)$$

2. $x^3 - 2x^2 + 18; x = 2$

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

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

5. $(2x^2 + 3x - 4)(x^2 - 3x + 7)$

6. $(2x^2 + 3x - 4)(x^2 - 3x + 7)$

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

8. $(2x^2 + 3x - 4)(x^2 - 3x + 7)$

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

10. $(2x^2 + 3x - 4)(x^2 - 3x + 7)$

11. $(2x^2 + 3x - 4)(x^2 - 3x + 7)$

12. $(2x^2 + 3x - 4)(x^2 - 3x + 7)$

13. $(2x^2 + 3x - 4)(x^2 - 3x + 7)$

14. $(2x^2 + 3x - 4)(x^2 - 3x + 7)$

15. $(2x^2 + 3x - 4)(x^2 - 3x + 7)$

16. $(2x^2 + 3x - 4)(x^2 - 3x + 7)$

17. $(2x^2 + 3x - 4)(x^2 - 3x + 7)$

18. $(2x^2 + 3x - 4)(x^2 - 3x + 7)$

19. $(2x^2 + 3x - 4)(x^2 - 3x + 7)$

20. $(2x^2 + 3x - 4)(x^2 - 3x + 7)$

4-04 FIND RATIONAL ZEROS OF POLYNOMIAL FUNCTIONS

Mixed Review

$$3. (4-01) Simplify $(x + 4)^2$.$$

Mixed Review

$$4. (3-05) Solve $0 = x^2 - 3x + 1$.$$

Mixed Review

$$5. (2-02) Write a quadratic function passing through (0, 2) with intercepts (-2, 0) and (-1, 0).$$

4-04

Solve by factoring.

$$7. 3x^3 + 15x^2 + 18x = 0$$

$$8. 2x^3 + 3x^2 - 8x = 12$$

9. $(6x^3 + 13x^2 + 3x - 2) \div (2x^2 + 3x - 1)$

10. $(9x^3 + 6x^2 - 23x + 10) \div (3x - 2)$

Mixed Review

$$11. (4-03) Simplify $(2x^3 + 3x^2 - 4x + 5) \div (x^2 + 3x - 1)$$$

12. $(4-03) Simplify (3x^5 - 5x^3 - x + 4) \div (x - 2)$

13. $(4-02) 2x^2 + 9x + 4 = 0$

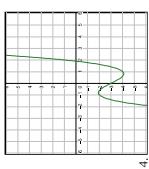
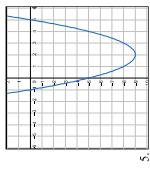
14. $(4-02) 2x^3 + 2x^2 = 24x$

15. $(4-02) x^3 + 2x^2 - 16x - 32 = 0$

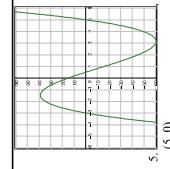
16. $x < -3$ or $x > 3$

17. $x = 3$

18. $x = -1 \pm \sqrt{3}$



1. $3x^2 - 6$
 2. $2x^2 + 3x - 7$
 3. $-4x^2 - 3x \leq 4$
 4. $1, 4$



1. $4x^2 - 2$
 2. $-3, -2, 2$

4-04
 1. 9
 2. 25
 3. 30
 4. 300
 5. 7
 6. $-4, -3, 1$

4-05
 1. $1, 1, \pm 2, \pm 3, \pm 6, \pm 9, \pm 18$
 2. $\pm \frac{1}{2}, \pm 1$
 3. $1, \pm \frac{1}{2}, \pm 2, \pm \frac{3}{2}, \pm 3, 16$
 4. $\pm 1, \pm \frac{1}{2}, \pm \frac{1}{4}, \pm 2, \pm 3, \pm \frac{3}{2}, \pm 4, \pm 6, \pm 8, \pm 12, \pm 24$
 5. $-2, 3, 4$
 6. $-5, 1, 2$
 7. $-1, 1/2, 1$
 8. $-2, -1/3, 1$
 9. $-2, -3/2, -1, 2$
 10. $-5, 1, 2 \pm i$
 11. $-4, 2/3, 1 \pm 2i$
 12. 10
 13. $2x^2 + 3x - 1$
 14. $(x-3)(x-2)(x+2)$
 15. $4x^2 - x + 16$

4-06
 1. $x^2 - 2x + 3$
 2. $x^2 - 4x - 21$
 3. $x^2 + 11x + 11x - 4$
 4. $4x^2 + 4x + 1$
 5. $x(x + 1)(x + 5)$
 6. $x(2x + 1)(x^2 + 4)$
 7. $-3, -2, 0$

4 REVIEW

1. $-2x^2 + 3$
 2. $x^2 - 4x - 21$
 3. $x^2 + 11x + 11x - 4$
 4. $4x^2 + 4x + 1$
 5. $x(x + 1)(x + 5)$
 6. $x(2x + 1)(x^2 + 4)$
 7. $-3, -2, 0$

8. $-x^2 - 3x + 2$
 9. $3x^2 + 2$
 10. $3x^2 - 4x - 5$
 11. $3x^2 - 5x + 6 + \frac{-4}{x+4}$
 12. $2x^3 + 6x^2 + 21x + 68 + \frac{-4x}{x-3}$
 13. $36x + 1, 2, 0$

14. 7
 15. Yes
 16. No
 17. $\pm 1, 2, -4, +8, \pm 16$
 18. $\pm 1/2, \pm 1, 2, \pm 4, \pm 8$
 19. $-23, -1/2, 2$
 20. $-1, 2, -2/3$