NAME Key CLASS DATE

LESSON 17-1

41. Factor each polynomial.

a. $x^2 - 7x + 12$

b. $3x^2 + x - 10$

$(3x-5)(x+2)$

c. $3x^4 + 2x^2 - 5$

$(3x^2+5)(x-1)(x+1)$

d. $x^2 + 5x - 36$

42. Factor by grouping.

a. $2x^3 - 6x^2 + 5x - 15$

b. $3x^4 - x^3 + 6x - 2$

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

c. $x^3 + 5x^2 - 9x - 45$

$(x+5)(x+3)(x-3)$

d. $x^3 - 5x^2 - 3x + 15$

43. Factor each sum or difference of cubes.

a. $x^3 + 125$

b. $x^3 - 8$

c. $8x^3 + 216$

$(2x+6)(4x^2-12x+36)$

d. $64x^3 - 27$

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

44. Use the formulas for factoring quadratic binomials and trinomials to factor each expression.

a. $25x^4 - 169$

b. $x^4 + 6x^2 + 9$

c. $x^6 - 10x^3 + 25$

$(x^3-5)(x^3-5) = (x^3-5)^2$

d. $4x^{10} - 81$

$(2x^5-9)(2x^5+9)$

45. **Make use of structure.** Which of the following are the factors of $27x^3 - 8$?

A. $(3x - 2)(9x^2 - 6x - 4)$

B. $(3x - 2)(9x^2 + 6x - 4)$

C. $(3x - 2)(9x^2 - 6x + 4)$

D. $(3x - 2)(9x^2 + 6x + 4)$

NAME CLASS DATE

LESSON 17-2

46. Find the zeros of the functions. Show that the Fundamental Theorem of Algebra is true for each function by counting the number of complex zeros.

a. $f(x) = x^3 + 4x$

b. $g(x) = x^4 - 81$

$0 = (x^2 - 9)(x^2 + 9)$

$0 = (x+3)(x-3)(x^2+9)$

$x = 3 \quad x = -3 \quad x = \pm 3i$

c. $h(x) = 2x^4 - 16x^3 + 32x^2$

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

$0 = 4x^2(x-1) - 1(x-1)$

$= (4x^2 - 1)(x-1)$

$= (2x-1)(2x+1)(x-1)$

$x = \frac{1}{2}$, $x = -\frac{1}{2}$, $x = 1$

47. **Attend to precision.** Complete the following statement:

As a consequence of the Fundamental Theorem of Algebra,

48. Write a polynomial function of n^{th} degree that has the given real roots. & goes through the given point.

a. $n = 3$; zeros: $-1, 0, 2$ $(1, 4)$

b. $n = 4$; zeros: $-3, 2, \pm 1$ $(-2, -4)$

c. $n = 3$; $x = -1$, and $x = 3$ is a double root $(-3, 36)$

$y = a(x+1)(x-3)^2$

$y = -\frac{1}{2}(x+1)(x-3)^2$

d. ~~$n = 4$~~; $x = -2$ is a double root and $x = 5$ is a double root. $(-1, 24)$

$y = a(x+2)^2(x-5)^2$

$y = \frac{2}{3}(x+2)^2(x-5)^2$

49. Which is the degree of the polynomial function with the roots $x = -3$, $x = \frac{2}{3}$, $x = i$, and $x = 1 - i$?

A. 4 **B.** 5

C. 6 **D.** 8

50. Write a polynomial function of n^{th} degree that has the given real or complex roots. in stadard form.

a. $n = 3$; $x = 2$, $x = 3i$

$y = (x-2)(x-3i)(x+3i)$

$y = (x-2)(x^2+9)$

$y = x^3 - 2x^2 + 9x - 1$

b. $n = 4$; $x = -i$, $x = 1 + 3i$

c. $n = 5$; $x = 0$ is a double root, $x = 3$, $x = 2 - i$

$y = x^5 - 7x^4 + 17x^3 - 15x^2$

d. ~~$n = 4$, $x = \frac{1}{2}i$, $x = \pm\frac{1}{2}$~~

NAME CLASS DATE

LESSON 18-1

51. Match each equation to its graph.

a. $f(x) = -\frac{1}{3}x - 2$ I

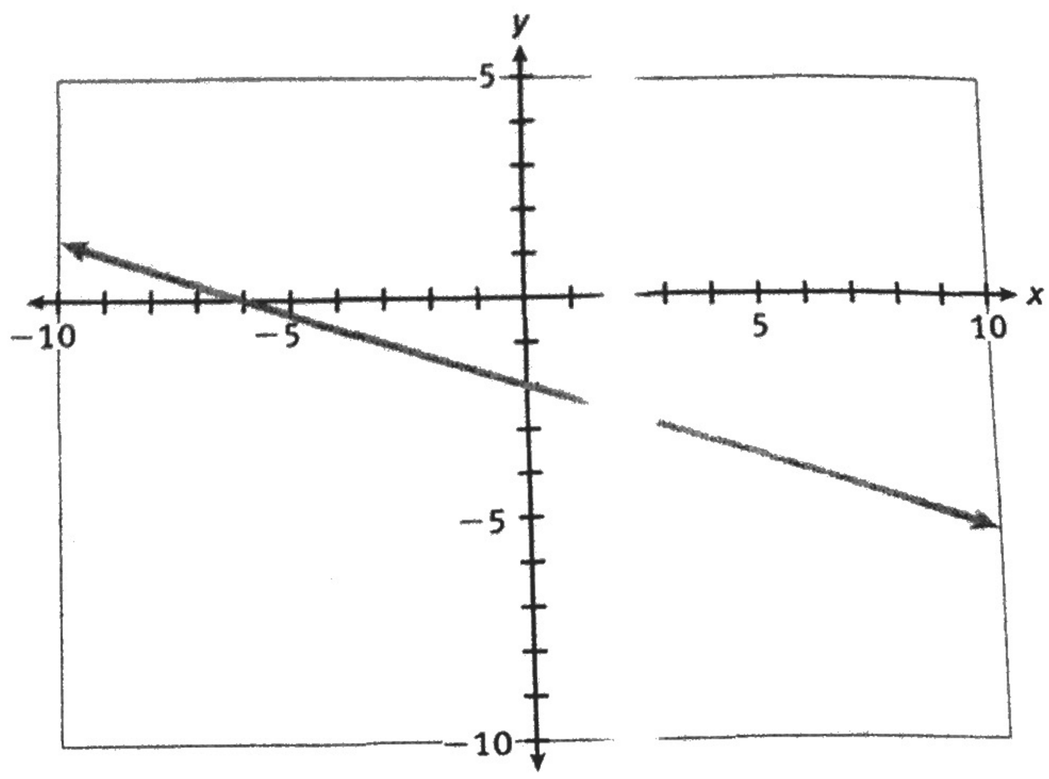
b. $g(x) = x^2 + 3$ V

c. $h(x) = 2x^3 - 3x^2 + 1$ III

d. $j(x) = \frac{1}{2}x^4 - 3x^2 + 4$ II

e. $k(x) = -\frac{1}{2}x^5 - x^4 - x^3 - x^2 - x$ IV

I.



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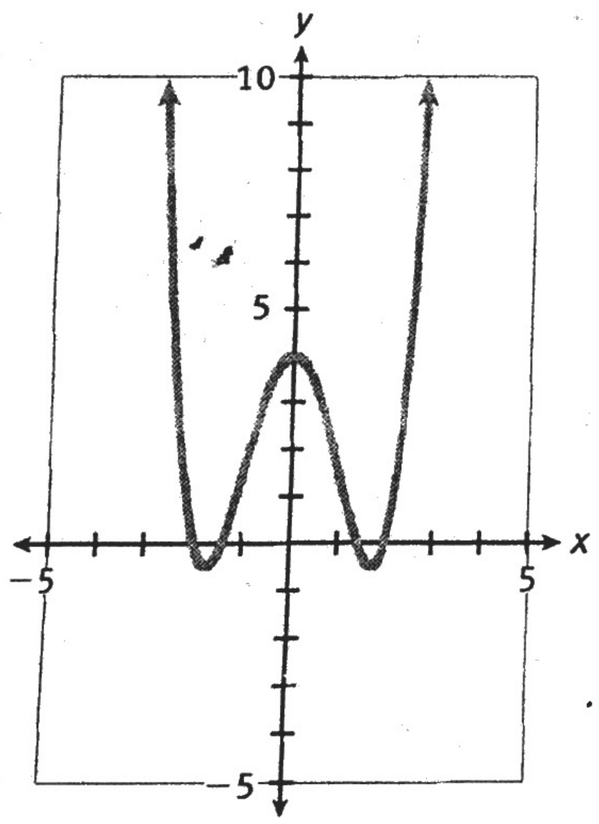

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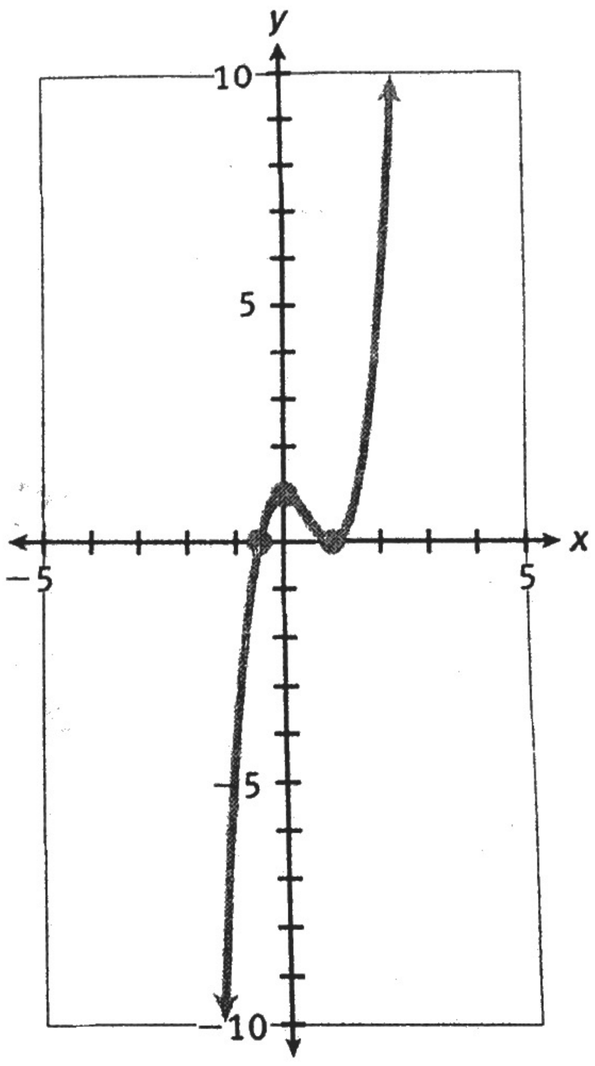

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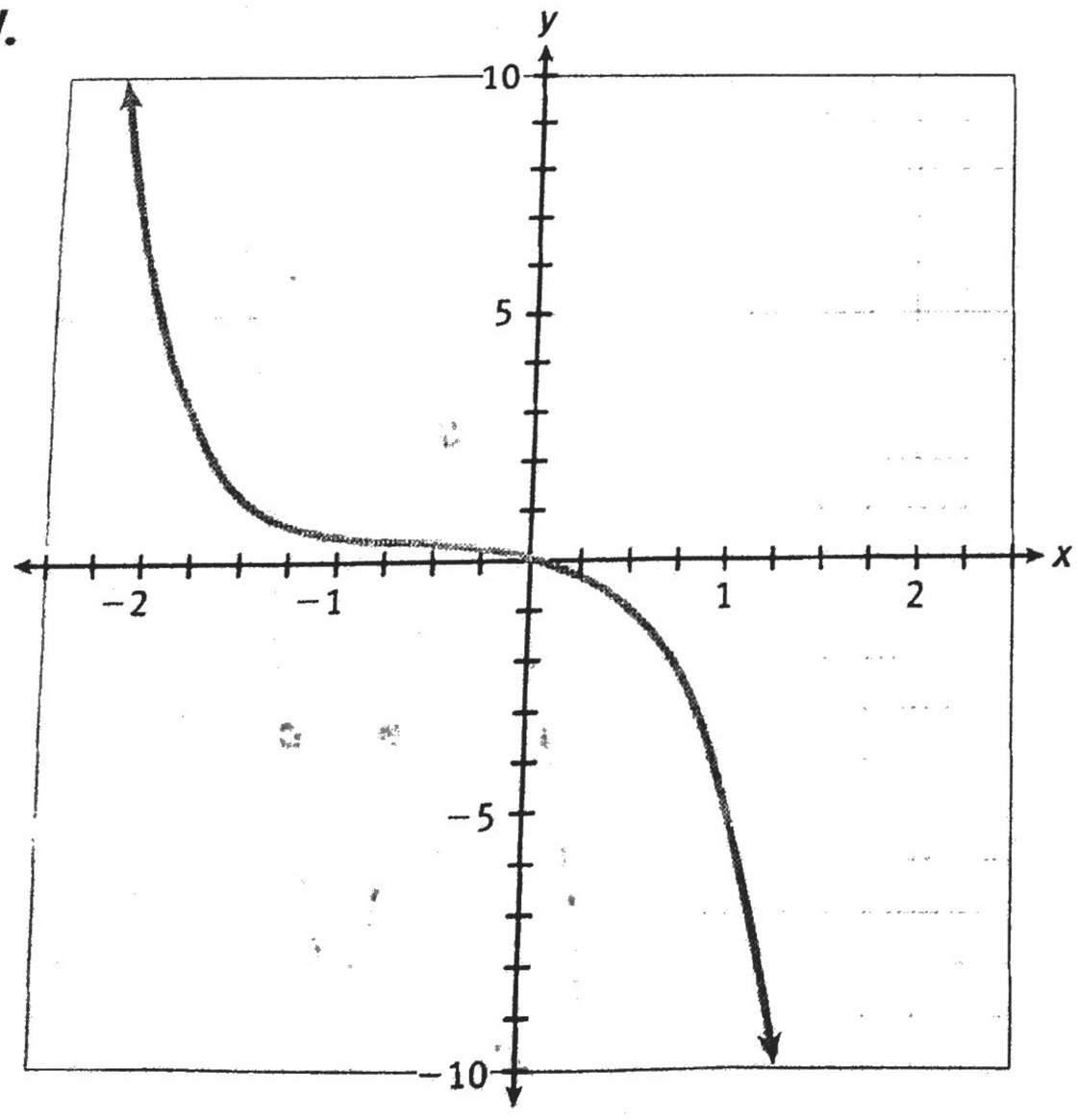

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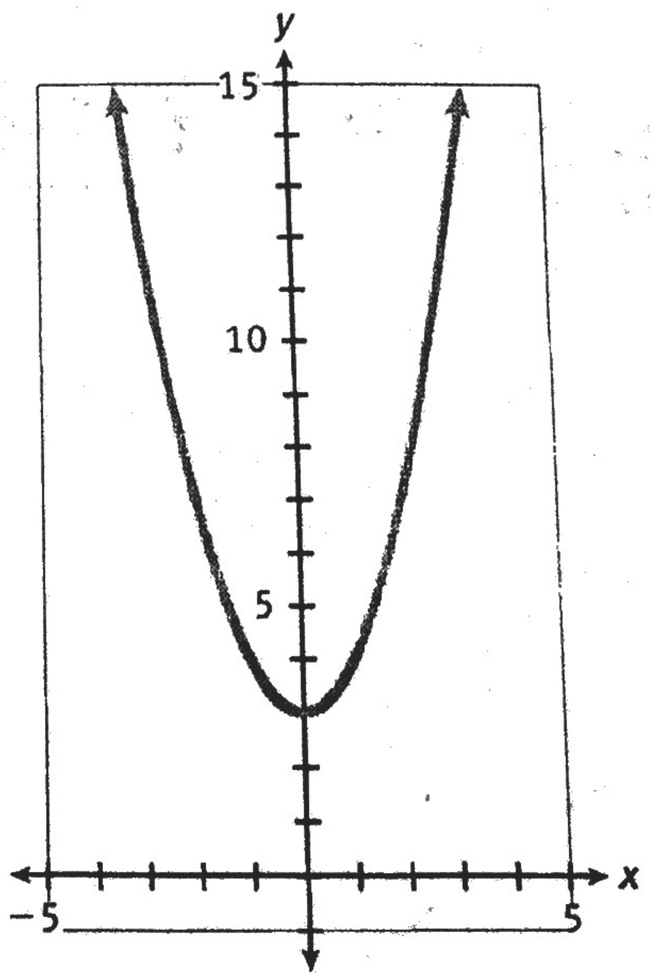


NAME CLASS DATE

52. For polynomials, relative extrema occur

A. where the graph crosses the y-axis.

B. at the ends of the polynomial function.

C. where the graph crosses the x-axis.

D. between the zeros of the polynomial function.

53. **Use appropriate tools.** Use a graphing calculator to graph the polynomial functions. Determine the coordinates of the intercepts and relative extrema.

a. $f(x) = x^4 + x^3 - 50x^2 + x$

b. $g(x) = -x^3 - 19x^2 - 48$

54. Sketch the graph of a polynomial function that increases as $x \to \infty$, decreases as $x \to -\infty$, and has zeros at $x = -5$, 0, and 2.

55. **a.** Use a graphing calculator to graph $f(x) = -x^4 + 3x^3 + 5x^2 - 10x + 1$.

b. Find all the intercepts of the function.

c. Find the relative extrema of the function.

LESSON 18-2

56. Find all possible rational roots of each equation.

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

$\frac{5}{3} = \frac{1, 5}{1, 3} = \pm 1, \pm\frac{1}{3}, \pm 5, \pm\frac{5}{3}$

b. $g(x) = 2x^4 + 7x^3 - 3x^2 + 5x - 6$

57. Given $p(x) = -x^5 + 6x^4 - 3x^3 - 5x^2 + 3x - 7$:

a. How many sign changes are there?

b. How many possible positive real roots are there?

c. Find $p(-x)$.

d. How many negative real roots are there?

58. **Make use of structure.** Find the number of positive and negative real roots of each equation. Explain.

a. $h(x) = x^3 - x^2 + 3x + 5$

b. $j(x) = 5x^4 - 2x^3 + 3x^2 + 10x - 5$

59. Given $k(x) = x^3 - 2x^2 - 5x + 6$ $\pm 1, \pm 2, \pm 3, \pm$

a. Find the real zeros of $k(x)$.

1 | 1 -2 -5 6
1 -1 -6
1 -1 -6 | 0

$x = 1$, $x = 3$, $x = -2$

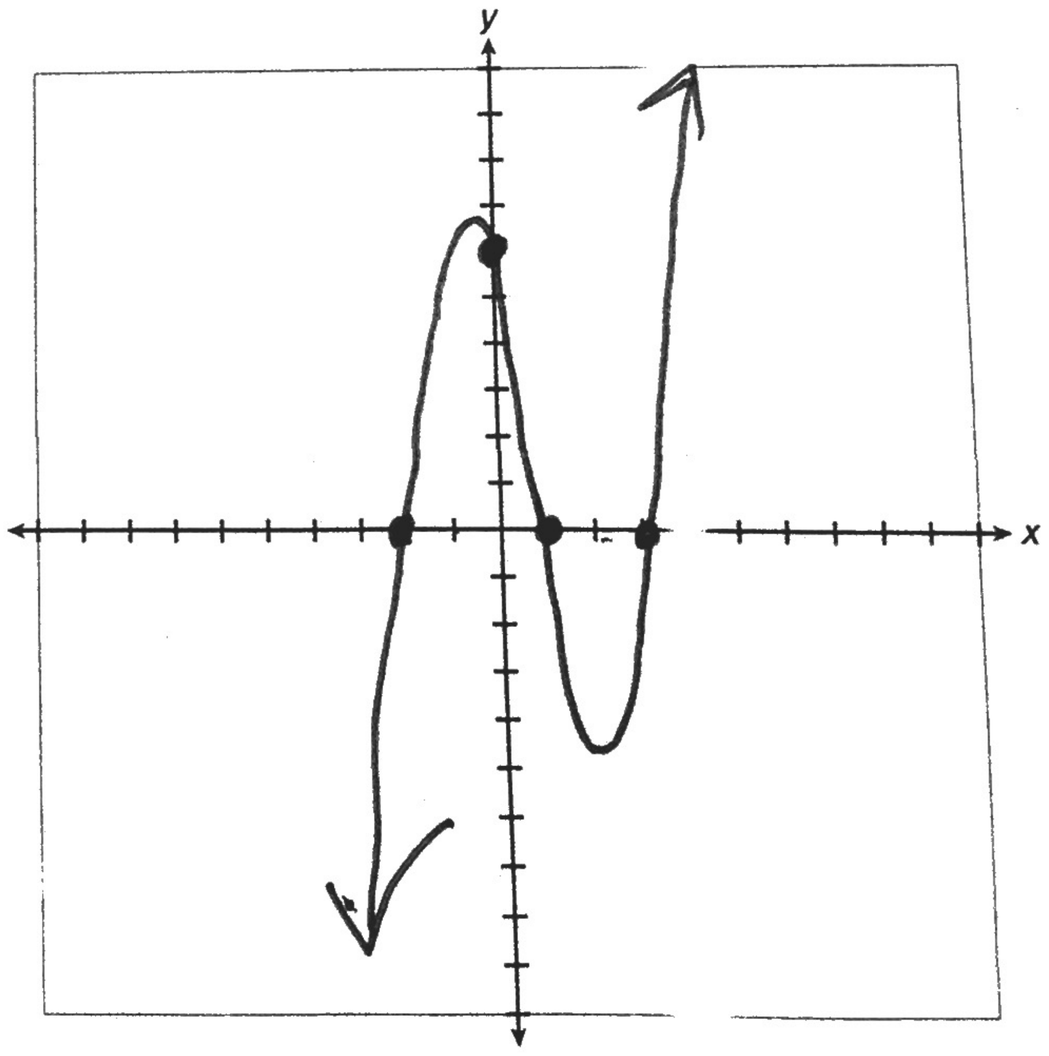
$x^2 - x - 6$
$(x - 3)(x + 2)$

b. What is the y-intercept?

$y = 6$

c. Find the relative maximum and minimum to the nearest integer.

d. Graph $k(x)$ by hand.



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