

X-intercepts and the Nature of Roots

On looseleaf, do #17, 19, 21-28 (all), 31-43 (odds)
 Use $h = -\frac{b}{2a}$ for the vertex.

9. $2x^2 + 9x - 5 = 0$
 10. $3x^2 + 7x + 2 = 0$
 11. $3x^2 - 7x = 0$
 12. $2x^2 - 15x = 0$
 13. $4x^2 - 12x + 9 = 0$
 14. $9x^2 + 30x + 25 = 0$
 15. $x^2 + 2x + 13 = 0$
 16. $x^2 - 10x + 26 = 0$
 17. $2x^2 + 2x - 2 = x - x^2$
 18. $4x^2 - 8x + 5 = x + 3$
 19. $x^2 - 2x + 2 = 2x$
 20. $2x^2 - 2x - 2 = x^2$

For Problems 21 through 30, find the discriminant. Then, without actually solving the equation, tell what kind of numbers the solutions will be, real or imaginary. If the solutions are real numbers, tell whether they will be rational or irrational.

21. $3x^2 - 5x + 6 = 0$
 22. $5x^2 + 7x - 3 = 0$
 23. $2x^2 - 13x + 15 = 0$
 24. $9x^2 + 6x + 1 = 0$
 25. $10x^2 + 19x + 7 = 0$
 26. $x^2 - 6x + 3 = 0$
 27. $-3x^2 + 5x - 2 = 0$
 28. $x^2 + x + 1 = 0$
 29. $-x^2 + 4x - 4 = 0$
 30. $x^2 + 6x + 10 = 0$

For Problems 31 through 44, find the vertex, the x- and y-intercepts, and the symmetric point, and sketch the graph.

31. $y = x^2 - 6x + 8$
 32. $y = x^2 + 4x + 3$
 33. $y = x^2 - 2x - 15$
 34. $y = x^2 + 2x - 8$
 35. $y = -x^2 - 2x + 3$
 36. $y = -x^2 + 4x + 5$
 37. $y = 2x^2 + 7x + 3$
 38. $y = 3x^2 - 7x + 2$
 39. $y = -4x^2 + 4x - 1$
 40. $y = x^2 + 6x + 9$
 41. $y = x^2 + 2x + 5$
 42. $y = -2x^2 + 4x - 3$
 43. $y = x^2 + 2x - 5$
 44. $y = -x^2 + 4x - 1$

45. **Solving Quadratics by Completing the Square** If you did not know the quadratic formula, you could still solve a quadratic equation. All you have to know is how to complete the square. The following example shows you the way.

- $5x^2 + 30x + 7 = 0$
 The equation to be solved
- $5x^2 + 30x = -7$
 Clear off space to complete the square.
- $x^2 + 6x = -1.4$
 Divide by 5 to make the x^2 -coefficient equal 1.

9. $\left\{ \frac{1}{2}, -5 \right\}$
 10. $\left\{ -\frac{1}{3}, -2 \right\}$
 11. $\left\{ \frac{7}{3}, 0 \right\}$
 12. $\left\{ \frac{15}{2}, 0 \right\}$
 13. $\left\{ \frac{3}{2} \right\}$
 14. $\left\{ -\frac{5}{3} \right\}$
 15. no real solutions
 16. no real solutions
 17. $\left\{ \frac{2}{3}, -1 \right\}$
 18. $\left\{ 2, \frac{1}{4} \right\}$
 19. $\left\{ \sqrt{2}, 2, 2, 2, 2, 2 \right\}$
 20. $\left\{ \sqrt{3}, -1, 1 \right\}$
 21. -47 imaginary
 22. 109 real, irrational
 23. 49 real, rational
 24. 0 real, rational
 25. 18 real, rational
 26. 24 real, irrational
 27. 1 real, rational
 28. -3 imaginary
 29. 0 real, rational
 30. -4 imaginary
 31-44. See Additional Answers.