Caution: Never transform an equation by dividing by an expression containing a variable. Notice that in Example 4, the solution 0 would have been lost if both sides of $2y(9y^2 + 12y + 4) = 0$ had been divided by $2y$.

Oral Exercises

Solve.

1. $x(x - 6) = 0$
2. $2a(a + 1) = 0$
3. $0 = 3p(2p - 1)$
4. $(y - 2)(y + 3) = 0$
5. $0 = (3t - 2)(t - 3)$
6. $x(2x - 5)(2x + 1) = 0$

Explain how you could solve the given equation. Then solve.

7. $4x^2 - x^3 = 0$
8. $a^3 = 4a$
9. $k^2 + 4 = 4k$
10. $m^3 - 2m = m^2$
11. $9x^2 = x^3$
12. $0 = -n^3 + n$
13. Give an example of a true "if-then" statement with a false converse.

Written Exercises

Solve.

A

1. $(y + 5)(y - 7) = 0$
2. $(n + 1)(n + 9) = 0$
3. $15n(n + 15) = 0$
4. $2x(x - 20) = 0$
5. $(2t - 3)(3t - 2) = 0$
6. $(2u + 7)(3u - 1) = 0$
7. $3x(2x + 1)(2x + 5) = 0$
8. $n(5n - 2)(2n + 5) = 0$
9. $y^2 - 3y + 2 = 0$
10. $p^2 - p - 6 = 0$
11. $0 = x^2 + 14x + 48$
12. $0 = k^2 - 12k + 35$
13. $m^2 - 36 = 16m$
14. $r^2 + 9 = 10r$
15. $s^2 = 4s + 32$
16. $x^2 = 20x - 100$
17. $y^2 = 16y$
18. $9k^2 = 4k$
19. $4x^2 - 9 = 0$
20. $25m^2 - 16 = 0$
21. $6n^2 + n = 2$
22. $3x^2 + x = 2$
23. $4s - 4s^2 = 1$
24. $r - 6r^2 = -1$
25. $7x^2 = 18x - 11$
26. $2y^2 = 25y + 13$
27. $8u^3 - 2u^2 = 0$
28. $10u^3 - 5u^2 = 0$
29. $0 = 4y^3 - 2y^2$
30. $0 = 10x^3 - 15x^2$
31. $8y^2 - 9y + 1 = 0$
32. $6h^2 + 17h + 12 = 0$
33. $15u^2 - 14u = 49$
34. $25x^2 - 90x = -81$
35. $4p^2 + 121 = 44p$
36. $6c^2 - 72 = 11c$

B

37. $4x^3 - 12x^2 + 8x = 0$
38. $2n^3 - 30n^2 + 100n = 0$
39. $9x^3 + 9x = 30x^2$
40. $9x^3 + 25x = 30x^2$
41. $y^4 - 10y^2 + 9 = 0$
42. $u^5 - 13u^3 + 36u = 0$

Sample 1 $(x - 1)(x + 3) = 12$

Solution $x^2 + 2x - 3 - 12 = 0$

$(x - 3)(x + 5) = 0$ $\therefore$ the solution set is $\{3, -5\}$

Solve. See Sample 1 on page 232.

43. $(z + 1)(z - 5) = 16$

44. $(2t - 5)(t - 1) = 2$

45. $(x - 2)(x + 3) = 6$

46. $(a - 5)(a - 2) = 28$

47. $x(x - 6) = 4(x - 4)$

48. $3(m + 2) = m(m - 2)$

Find an equation in standard form with integral coefficients that has the given solution set.

Sample 2 $\left\{\frac{2}{3}, -4\right\}$

Solution

$$\left(x - \frac{2}{3}\right)(x + 4) = 0$$

$$3\left(x - \frac{2}{3}\right)(x + 4) = 0$$

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

Multiply by 3 for integral coefficients.

$$3x^2 + 10x - 8 = 0$$ ***Answer***

49. $\{2, -3\}$

50. $\{-1, 5\}$

51. $\left\{\frac{5}{2}, -2\right\}$

52. $\left\{-\frac{1}{3}, -1\right\}$

53. $\left\{\frac{1}{3}, \frac{3}{2}\right\}$

54. $\left\{-\frac{5}{2}, \frac{2}{5}\right\}$

C **55.** Supply the missing reasons in the proof of: If $ab = 0$, then $a = 0$ or $b = 0$.

Case 1: If $a = 0$, then the theorem is true; there is nothing to prove.

Case 2: Suppose that $a \neq 0$ and show that then $b = 0$.

a. $ab = 0$	**a.** Given
b. $\frac{1}{a}$ exists	**b.** ?
c. $\frac{1}{a}(ab) = \frac{1}{a}(0)$	**c.** ?
d. $\frac{1}{a}(ab) = 0$	**d.** ?
e. $\left(\frac{1}{a} \cdot a\right)b = 0$	**e.** ?
f. $1 \cdot b = 0$	**f.** ?
g. $b = 0$	**g.** ?

Mixed Review Exercises

Evaluate if $x = 2$ and $y = 4$.

1. $(x - y)^4$

2. $x^4 \cdot y^2$

3. $5x^3$

4. $(5x)^3$

5. $4x + y^2$

6. $4x^2 + y$

7. $4(x + y)^2$

8. $(yx)^2$

9. y^2x^2

Simplify.

10. $(3x^3y)(-2xy^5)$

11. $(9a)^3$

12. $-5(x + 2)$