Cumulative Review: Chapters 1–3, 5–8

1. Evaluate
$$\frac{2x - y^2}{x + y}$$
for $x = 3$ and $y = -4$. [1.8]

2. Convert to scientific notation: 391,000,000. [5.2]

3. Determine the slope and the y-intercept for the line given by $7x - 4y = 12$. [3.6]

4. Find an equation for the line that passes through the points $(-1, 7)$ and $(4, -3)$. [3.7]

5. If
$$f(x) = \frac{x - 3}{x^2 - 11x + 30},$$
find **(a)** $f(3)$ and **(b)** the domain of f. [8.1], [8.2]

Graph on a plane.

6. $5x = y$ [3.2]

7. $8y + 2x = 16$ [3.3]

8. $f(x) = -4$ [8.2]

9. $y = \frac{1}{3}x - 2$ [3.6]

Perform the indicated operations and simplify.

10. $(8x^3y^2)(-3xy^2)$ [5.1]

11. $(5x^2 - 2x + 1)(3x^2 + x - 2)$ [5.5]

12. $(3x^2 + y)^2$ [5.6]

13. $(2x^2 - 9)(2x^2 + 9)$ [5.6]

14. $(-5m^3n^2 - 3mn^3) + (-4m^2n^2 + 4m^3n^2) - (2mn^3 - 3m^2n^2)$ [5.4]

15. $\dfrac{y^2 - 36}{2y + 8} \cdot \dfrac{y + 4}{y + 6}$ [7.2]

16. $\dfrac{x^4 - 1}{x^2 - x - 2} \div \dfrac{x^2 + 1}{x - 2}$ [7.2]

17. $\dfrac{5ab}{a^2 - b^2} + \dfrac{a + b}{a - b}$ [7.4]

18. $\dfrac{2}{m + 1} + \dfrac{3}{m - 5} - \dfrac{m^2 - 1}{m^2 - 4m - 5}$ [7.4]

19. $y - \dfrac{2}{3y}$ [7.4]

20. Simplify: $\dfrac{\frac{1}{x} - \frac{1}{y}}{x + y}$. [7.5]

Factor.

21. $4x^3 + 400x$ [6.1]

22. $x^2 + 8x - 84$ [6.2]

23. $16y^2 - 25$ [6.4]

24. $64x^3 + 8$ [6.5]

25. $t^2 - 16t + 64$ [6.4]

26. $x^6 - x^2$ [6.4]

27. $\frac{1}{8}b^3 - c^3$ [6.5]

28. $3t^2 + 17t - 28$ [6.3]

29. $x^5 - x^3y + x^2y - y^2$ [6.1]

Solve.

30. $8x = 1 + 16x^2$ [6.7]

31. $288 = 2y^2$ [6.7]

32. $\frac{1}{3}x - \frac{1}{5} \geq \frac{1}{5}x - \frac{1}{3}$ [2.6]

33. $5(x - 2) - (x - 3) = 7x - 2(5 - x)$ [2.2]

34. $\dfrac{6}{x - 5} = \dfrac{2}{2x}$ [7.6]

35. $\dfrac{3x}{x - 2} - \dfrac{6}{x + 2} = \dfrac{24}{x^2 - 4}$ [7.6]

36. $P = \dfrac{4a}{a + b}$, for a [8.5]

37. Find the slope of the line containing $(2, 5)$ and $(1, 10)$. [3.5]

38. Find the slope of the line given by $f(x) = 8x + 3$. [8.3]

39. Find the slope of the line given by $y + 6 = -4$. [3.5]

40. Find an equation of the line containing $(5, -2)$ and perpendicular to the line given by $x - y = 5$. [3.7]

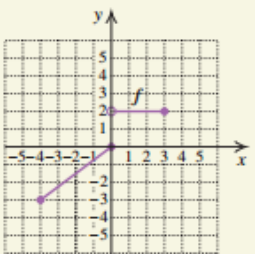
Find the following, given that $f(x) = x + 5$ and $g(x) = x^2 - 1$.

41. $g(-10)$ [8.1]

42. $(g/f)(x)$ [8.4]

43. Find the domain of f if $f(x) = \dfrac{x}{x + 6}$. [8.2]

44. Determine the domain and the range of the function f represented below. [8.2]



45. *Broadway revenue.* Gross revenue from Broadway shows has grown from \$20 million in 1986–1987 to \$939 million in 2006–2007. Let $r(t)$ represent gross revenue, in millions of dollars, from Broadway shows t seasons after the 1986–1987 season. [8.3]
Source: The League of American Theatres and Producers

a) Find a linear function that fits the data.
b) Use the function from part (a) to predict the gross revenue from Broadway shows in 2009–2010.
c) In what season will the gross revenue from Broadway shows reach \$1.4 billion?

46. *Broadway performances.* In January 2006, *The Phantom of the Opera* became the longest-running Broadway show with 7486 performances. By January 2008, the show had played 8302 times. Calculate the rate at which the number of performances was rising. [3.4]

47. *Quilting.* A rectangular quilted wall hanging is 4 in. longer than it is wide. The area of the quilt is 320 in^2. Find the perimeter of the quilt. [6.8]

48. *Hotel management.* The IQAir HealthPro Plus air purifier can clean the air in a 20-ft by 25-ft meeting room in 5 fewer minutes than it takes the Austin Healthmate HM400 to do the same job. Together the two machines can purify the air in the room in 6 min. How long would it take each machine, working alone, to purify the air in the room? [7.7]
Source: Manufacturers' and retailers' websites

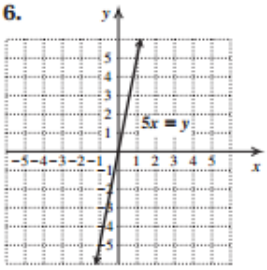
49. *Driving delays.* According to the National Surface Transportation Policy and Revenue Study Commission, the best-case scenario for driving delays due to road work in 2055 will be 250% of the delays in 2005. If the commission predicts 30 billion hr of driving delays in 2055, how many hours of driving delays were there in 2005? [2.5]

ANSWERS – Cumulative Review Chapters 1 to 3 and 5 to 8

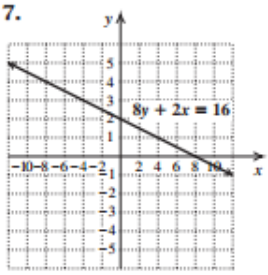
Cumulative Review: Chapters 1–3, 5–8, pp. 560–562

1. 10 **2.** 3.91×10^8 **3.** Slope: $\frac{7}{4}$; y-intercept: $(0, -3)$
4. $y = -2x + 5$ **5.** **(a)** 0; **(b)** $\{x|x$ is a real number *and* $x \neq 5$ *and* $x \neq 6\}$

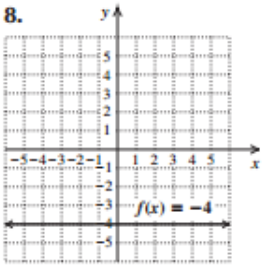
6.



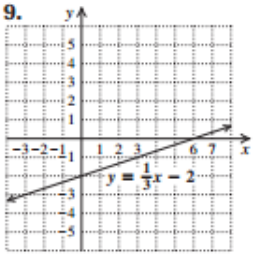
7.



8.



9.



10. $-24x^4y^4$ **11.** $15x^4 - x^3 - 9x^2 + 5x - 2$
12. $9x^4 + 6x^2y + y^2$ **13.** $4x^4 - 81$
14. $-m^3n^2 - m^2n^2 - 5mn^3$ **15.** $\dfrac{y-6}{2}$ **16.** $x - 1$
17. $\dfrac{a^2 + 7ab + b^2}{(a-b)(a+b)}$ **18.** $\dfrac{-m^2 + 5m - 6}{(m+1)(m-5)}$ **19.** $\dfrac{3y^2 - 2}{3y}$
20. $\dfrac{y-x}{xy(x+y)}$ **21.** $4x(x^2 + 100)$ **22.** $(x-6)(x+14)$
23. $(4y-5)(4y+5)$ **24.** $8(2x+1)(4x^2 - 2x + 1)$
25. $(t-8)^2$ **26.** $x^2(x-1)(x+1)(x^2+1)$
27. $\left(\frac{1}{2}b - c\right)\left(\frac{1}{4}b^2 + \frac{1}{2}bc + c^2\right)$ **28.** $(3t-4)(t+7)$
29. $(x^2 - y)(x^3 + y)$ **30.** $\frac{1}{4}$ **31.** $-12, 12$
32. $\{x|x \geq -1\}$, or $[-1, \infty)$ **33.** $\frac{3}{5}$ **34.** -1
35. No solution **36.** $a = \dfrac{Pb}{4 - P}$ **37.** -5 **38.** 8
39. 0 **40.** $y = -x + 3$ **41.** 99 **42.** $\dfrac{x^2 - 1}{x + 5}$
43. $\{x|x$ is a real number *and* $x \neq -6\}$
44. Domain: $\{x|-4 \leq x \leq 3\}$; or $[-4, 3]$; range: $\{y|-3 \leq y \leq 0$ *or* $y = 2\}$
45. **(a)** $r(t) = 45.95t + 20$; **(b)** \$1076.85 million; **(c)** in 2016–2017 **46.** 34 performances per month, or 408 performances per year **47.** 72 in. **48.** IQAir HealthPro: 10 min; Austin Healthmate: 15 min **49.** 12 billion hr
50. $22\frac{1}{2}$ min **51.** \$1.09 billion
52. $x^3 - 12x^2 + 48x - 64$ **53.** $-3, 3, -5, 5$
54. All real numbers except 9 and -5 **55.** $-\frac{1}{4}, 0, \frac{1}{4}$
56. $C(x) = \begin{cases} 12, \text{ if } x \leq 20, \\ 12 + 0.75(x - 20), \text{ if } x > 20 \end{cases}$