Math 096--Review for Test #4–page 1

Find the domain of the following.

1. a. $y = 3x + 8$ b. $y = x^2 - 4$ c. $y = \dfrac{5}{x+9}$

   d. $y = |x+3|$ e. $y = x^3 + 2$

Given $f(x) = x^2 - 9x + 2$, find

2. a. $f(5)$ b. $f(0)$ c. $f(-3)$

Simplify.

3. $\dfrac{3x+21}{x^2-16} \cdot \dfrac{x^2-7x+12}{5x+35}$

4. $\dfrac{4-x}{x^2+3x-10} \div \dfrac{3x^2-8x-16}{3x^2-2x-8}$

5. $\dfrac{3}{x^2-36} - \dfrac{5}{x+6} + \dfrac{7}{x-6}$

6. $\dfrac{7}{x+4} - \dfrac{3}{x^2-2x-24} - \dfrac{5}{x-6}$

Solve.

7. $\dfrac{3}{8} + \dfrac{2}{x} = \dfrac{1}{24}$

8. $\dfrac{7}{x-5} - \dfrac{4}{x+5} = \dfrac{40}{x^2-25}$

Simplify.

9a. $64^{\frac{5}{6}}$ 9b. $25^{-\frac{1}{2}}$ 9c. $-81^{\frac{1}{4}}$ 10. $7^{\frac{3}{8}} \cdot 7^{\frac{1}{5}}$

11. a. Write $\left(\sqrt[4]{z}\right)^{11}$ with a fractional exponent.

    b. Write $x^{\frac{2}{3}}$ in radical form.

    c. Write in exponent form and simplify: $\sqrt[6]{5^{24}}$

Simplify, using rules of radicals.

12. $\sqrt{28}$ 13. $\sqrt[3]{54}$ 14. $\sqrt{3} \cdot \sqrt{8}$

15. $\dfrac{\sqrt{20}}{\sqrt{2}}$

16. $21\sqrt{20} - 7\sqrt{80}$

17. $(3+2\sqrt{5})(7+4\sqrt{5})$

18. $\dfrac{\sqrt{2}}{\sqrt{7}}$

19. a. $\dfrac{5}{\sqrt{18}}$ b. $\dfrac{\sqrt{5}}{\sqrt{18}}$

20. $\dfrac{4}{7+\sqrt{3}}$

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Solve. Check.

21. $8 + \sqrt{x+3} = 12$

22. $\sqrt{-3x+16} = x+8$

Simplify, using rules of complex numbers.

23. $(7 + 9i) + (8 - 3i) - (10 - 5i)$

24. $(2 + 3i)(4 + 7i)$

25. $\dfrac{3+5i}{7-3i}$

26. i^{23}

Solve by the indicated method. Simplify any results; if necessary, use rules of radicals and rules of complex numbers. Do not write answers in decimal form!

27. Factor: $x^2 - 7x + 12 = 0$

28. Square Root Property: $y^2 - 18 = 0$

29. Complete the Square: $x^2 - 2x - 11 = 0$

30. Quadratic Formula: $5y^2 - 4y - 6 = 0$

Solve by an appropriate method. Simplify any results; if necessary, use rules of radicals and rules of complex numbers.

31. $z^2 + 5 = 0$

32. $3x^2 + 7x - 5 = 0$

33. $x^2 - 6x = 10$

34. $(x + 9)^2 = 20$

35. $\dfrac{1}{3}x^2 + \dfrac{4}{9}x - \dfrac{5}{6} = 0$

36. $x^2 + 3x + 5 = 0$

37. $2x^2 - 7x - 3 = 0$

38. $(x + 5)(x - 2) = -2$

39. $(3x - 1)(2x - 1) = -3$

40. $x^4 - 10x^2 + 9 = 0$

41. $x^4 + 2x^2 - 15 = 0$

42. $(x + 8)^2 + 7(x + 8) + 12 = 0$

Set up and solve.

43. A company has two copying machines. Machine A is older and takes 10 hours to run a certain print job. Machine B is newer and could run the same print job in 6 hours. If the two machines work together, how long would it take to run this print job?

44. A boat travels 108 miles downstream in the same time it travels 72 miles upstream. If the boat speed is 30 mph, find the speed of the current.

45. A ladder is leaning against a building and reaches a height of 23 feet on the building. The bottom of the ladder is 4 feet from the bottom of the building. How long is the ladder? Get a decimal result.

46. Joe drove a certain speed for 150 miles; then Joe increased his speed by 10 mph and drove 240 miles. If the total trip took 7 hours, what was Joe's original speed?

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Answer Key.

1. a. all reals b. all reals c. all reals except x = −9
   d. all reals e. all reals

2. a. f(5) = −18 b. f(0) = 2 c. f(−3) = 38

3. $\frac{3(x-3)}{5(x+4)}$ *or* $\frac{3x-9}{5x+20}$

4. $-\frac{1}{x+5}$

5. $\frac{3-5(x-6)+7(x+6)}{(x+6)(x-6)} \Rightarrow \frac{2x+75}{(x+6)(x-6)}$

6. $\frac{7(x-6)-3-5(x+4)}{(x+4)(x-6)} \Rightarrow \frac{2x-65}{(x+4)(x-6)}$

7. LCD 24x; $x \neq 0$
   3x(3) + 24(2) = x(1)
   solve
   x = −6
   {−6}

8. LCD (x + 5)(x − 5); $x \neq -5, 5$
   7(x+ 5) − 4(x − 5) = 40
   solve
   Empty Set
   x = −5 can't be used in the denominator

9a. 2^5 or 32

9b. $\frac{1}{5}$

9c. −3

10. $7^{\frac{23}{40}}$

11a. $z^{\frac{11}{4}}$

11b. $\sqrt[3]{x^2}$ *or* $\left(\sqrt[3]{x}\right)^2$

11c. $5^{\frac{24}{6}} \Rightarrow 5^4$ *or* 625

12. $2\sqrt{7}$

13. $3\sqrt[3]{2}$

14. $\sqrt{24} = 2\sqrt{6}$

15. $\sqrt{10}$

16. $14\sqrt{5}$

17. $61+26\sqrt{5}$

18. $\frac{\sqrt{14}}{7}$

19a. $\frac{5\sqrt{18}}{18} \Rightarrow \frac{15\sqrt{2}}{18} \Rightarrow \frac{5\sqrt{2}}{6}$

19b. $\frac{\sqrt{90}}{18} \Rightarrow \frac{3\sqrt{10}}{18} \Rightarrow \frac{\sqrt{10}}{6}$

20. $\frac{4(7-\sqrt{3})}{46} \Rightarrow \frac{2(7-\sqrt{3})}{23}$ or $\frac{14-2\sqrt{3}}{23}$

21. {13}

22. { −3 }
    x = −16 didn't check

23. 5 + 11*i*

24. −13 + 26 *i*

25. $\frac{21+9i+35i+15i^2}{49+21i-21i-9i^2} \Rightarrow \frac{6+44i}{58} \Rightarrow \frac{3+22i}{29}$

26. $i^{23} = (i^2)^{11} i = (-1)^{11} i = -1i \text{ or } -i$

27. {3, 4}

28. $\{\pm 3\sqrt{2}\}$

29. $\{1 \pm 2\sqrt{3}\}$

30. $\left\{\frac{2 \pm \sqrt{34}}{5}\right\}$

31. $\{\pm i\sqrt{5}\}$

32. $\left\{\frac{-7 \pm \sqrt{109}}{6}\right\}$

33. $\{3 \pm \sqrt{19}\}$

34. $\{-9 \pm 2\sqrt{5}\}$

35. multiply by LCD 18

$6x^2 + 8x - 15 = 0$

$a = 6, b = 8, c = -15$

$x = \frac{-8 \pm \sqrt{424}}{12} \Rightarrow \frac{-8 \pm 2\sqrt{106}}{12}$

36. $\left\{\frac{-3 \pm i\sqrt{11}}{2}\right\}$

37. $\left\{\frac{7 \pm \sqrt{73}}{4}\right\}$

38. $x^2 + 3x - 10 = 2$
$x^2 + 3x - 12 = 0$
$a = 1, b = 3, c = -12$
$x = \frac{-3 \pm \sqrt{57}}{2}$

39. $6x^2 - 5x + 1 = -3$
$6x^2 - 5x + 4 = 0$
$a = 6, b = -5, c = 4$
$x = \frac{5 \pm \sqrt{-71}}{12} \Rightarrow \frac{5 \pm i\sqrt{71}}{12}$

40. {± 3, ± 1}

$\left\{\frac{-4 \pm \sqrt{106}}{6}\right\}$

41. $\{\pm i\sqrt{5}, \pm\sqrt{3}\}$

42. $a = 1, b = 7, c = 12$

$x + 8 = \frac{-(7) \pm \sqrt{(7)^2 - 4(1)(12)}}{2(1)} \Rightarrow \frac{-7 \pm \sqrt{49 - 48}}{2}$

$x + 8 = \frac{-7 \pm \sqrt{1}}{2} \Rightarrow \frac{-7 \pm 1}{2} \Rightarrow \frac{-6}{2} \text{ or } \frac{-8}{2}$

$x + 8 = -3$ or -4
$x + 8 = -3$ or $x + 8 = -4$
$x = -11$ or $x = -12$
$\{-12, -11\}$

42 again. let $a = (x + 8)$

$a^2 + 7a + 12 = 0$

$(a + 3)(a + 4) = 0$

$a = -3$ or $a = -4$
$x + 8 = -3$ or $x + 8 = -4$
$x = -11$ or $x = -12$
$\{-12, -11\}$

43. x = combined time

$$\frac{1}{10}x + \frac{1}{6}x = 1$$

x = $3\frac{3}{4}$ *hours*

44. x = speed of current

$$\frac{108}{30+x} = \frac{72}{30-x}$$

x = 6 mph

45. x = length of ladder = hypotenuse

$4^2 + 23^2 = x^2$

x = $\sqrt{545}$ ≈ 23.3 feet

46. x = Joe's original speed

$$\frac{150}{x} + \frac{240}{x+10} = 7$$

x = 50 mph