Math 129 - Review 1

September 16, 2019

Name __key__

Score _____

These problems may help you review for Test 1. They are coded to match the course objectives from your syllabus. Your actual test will not be as long as this review packet. Unless otherwise indicated, you should simplify all answers by reducing fractions, simplifying radicals, and/or rationalizing denominators (as you've done on your ALEKS homework).

Objective: Recognize a single-variable equation as linear and solve it. (3)

1. Which one of these equations is NOT linear?

$$3x - 2 = 3x - 7, \qquad 8(x + 2) = 7(x - 5) + x, \qquad \frac{x}{5} + \frac{3}{7} = x, \qquad \boxed{5x + \frac{5}{x} = 5}$$

↑ X IN DENOM.

2. Solve for y: $3.5y - 10.4 = 1.5(y + 4)$

$$3.5y - 10.4 = 1.5y + 6$$
$$2y = 16.4 \implies \boxed{y = 8.2}$$

3. Solve for r: $\frac{r}{3} - \frac{1}{2} = -4$

CLEAR FRACTIONS... $2r - 3 = -24$
  MULT BY 6 $2r = -21$ $\boxed{r = -\frac{21}{2}}$

4. Solve for z: $\frac{12 - 6z}{3} = 8$

$$12 - 6z = 24$$
$$-6z = 12 \qquad \boxed{z = -2}$$

5. Solve for x: $2.1(x - 3) - 1.1 = 4(1.5 - 0.9x) + 3$

$$2.1x - 6.3 - 1.1 = 6 - 3.6x + 3$$
$$2.1x - 7.4 = -3.6x + 9$$
$$5.7x = 16.4 \qquad \boxed{x = \frac{16.4}{5.7}}$$

1

6. Solve for x: $2x + 4 - 3(-2x - 2) = 4(x - 1)$

$$2x + 4 + 6x + 6 = 4x - 4$$

$$8x + 10 = 4x - 4$$

$$4x = -14$$

$$\boxed{x = \frac{-7}{2}}$$

7. Solve for r: $-\dfrac{7}{4}r - \dfrac{1}{3} = r - \dfrac{3}{2}$

CLEAR FRACTIONS ... $-21r - 4 = 12r - 18$

MULT BY 12

$$-33r = -14$$

$$\boxed{r = \frac{14}{33}}$$

8. Solve for z: $2(z - 3) - 5z = -3(z + 3)$

$$2z - 6 - 5z = -3z - 9$$

$$-3z - 6 = -3z - 9$$

$$-6 = -9 \quad \rightarrow \boxed{\text{No SOLUTION.}}$$

CONTRADICTION

9. Solve for w: $4\left(-w + \dfrac{1}{3}\right) = \dfrac{4}{3} - 4w$

$$-4w + \frac{4}{3} = \frac{4}{3} - 4w$$

SAME ON EACH. $\rightarrow$ [ALL NUMBERS ARE

IDENTITY   SOLUTIONS.]

2

Objective: Translate a problem situation into an equation and solve. (3)

10. Translate the sentence into an equation. Use x for your variable. Do not solve the equation.

$$\overbrace{}^{X}$$
Three more than eight times a number is ten.

$$8x + 3 = 10$$

11. Translate the sentence into an equation. Use x for your variable. Do not solve the equation.

$$\overbrace{}^{X}$$
Nine less than five times a number is eight.

$$5x - 9 = 8$$

12. TechWiz Electronics makes a profit of \$35 for each MP3 player sold and \$18 for each DVD player sold. Last week, TechWiz sold a combined total of 136 MP3 and DVD players. Let x be the number of MP3 players TechWiz sold last week. Using the single variable, x, write an expression for the combined total profit (in dollars) TechWiz made from MP3 and DVD players last week.

$X = $ # OF MP3 PLAYERS

$136 - X = $ # OF DVD PLAYERS

$$PROFIT = 35X + 18(136 - X)$$

PROFIT = MP3 PROFIT + DVD PROFIT

3

13. Let m be the middle number of three consecutive integers. Write an expression for the sum of these integers.

$$(m-1) + m + (m+1)$$
$$= 3m$$

14. Let e be the middle number of three consecutive **even** integers. Write an expression for the sum of these integers.

$$(e-2) + e + (e+2)$$
$$= 3e$$

Objective: Write inequalities corresponding to problem situations. (3)

15. Write an inequality to represent the problem situation.

Jon cannot spend more than $50 at the store. Use x to represent the amount (in dollars) that Jon can spend.
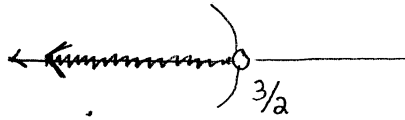
$$x \leq 50$$

16. Write an inequality to represent the problem situation.

You cannot drive slower than 45 mph and you cannot drive faster than 70 mph on the interstate. Use x to represent the speed (in mph) that you can drive.
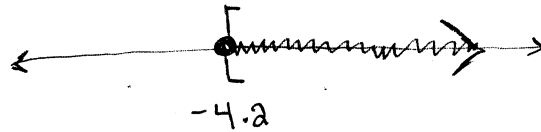
$$45 \leq x \leq 70$$

4

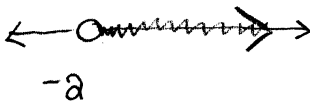**Objective**: Write an interval using inequalities and graph it. (3)

17. Graph the inequality on a number line: $x < 3/2$

18. Graph the inequality on a number line: $y \geq -4.2$

19. All points to the right of $x = -2$ (but not the point at $x = -2$) are shaded on a number line. What inequality is described by that graph?
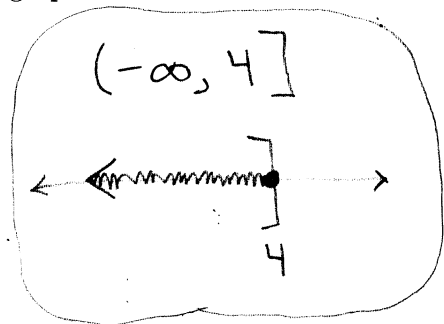

$$X > -2$$

Objective: Solve linear inequalities. (3)

20. Solve for z. Write your solution set in interval notation, and graph it on a number line.

$$-3z - 9 \geq -21$$

$-3z \geq -12$

$z \leq 4$

$(-\infty, 4]$

4

21. Solve for x. Write your solution set in interval notation, and graph it on a number line.
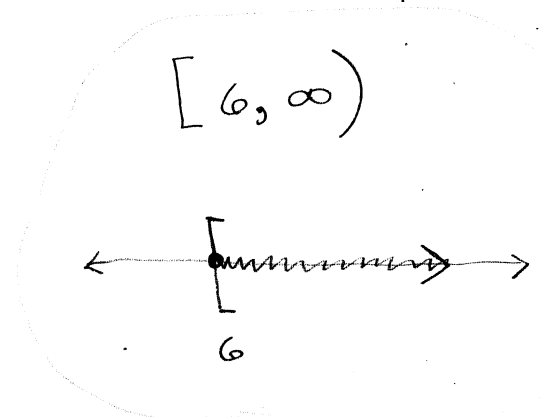
$$5x - 6 \leq 9x - 30$$

$24 \leq 4x$

$6 \leq X$

or

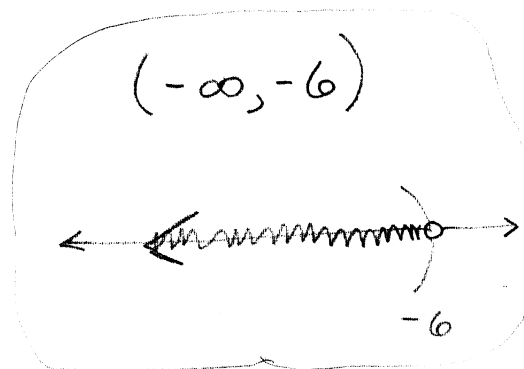$X \geq 6$

$[6, \infty)$

6

5

22. Solve for y. Write your solution set in interval notation, and graph it on a number line.

$$9y - 22 > -2(2 - 6y)$$

$9y - 22 > -4 + 12y$

$-18 > 3y$

$-6 > y$

$y < -6$

$(-\infty, -6)$

-6

23. Solve for w: $4(5w + 3) \leq 20w + 12$

$20w + 12 \leq 20w + 12$

$12 \leq 12$

Always!

All #'s ARE SOLUTIONS

$(-\infty, \infty)$

O
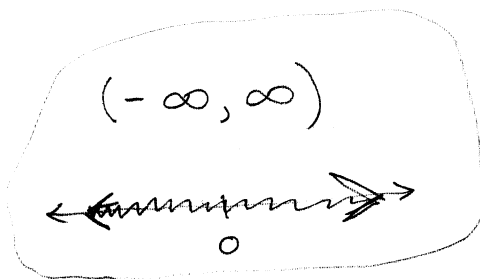
24. Solve for w: $-2(w + 7) + 29 < 2(6 - w)$

$-2w - 14 + 29 < 12 - 2w$

$-2w + 15 < 12 - 2w$

$15 < 12$

Never.

No SOLUTION

ϕ
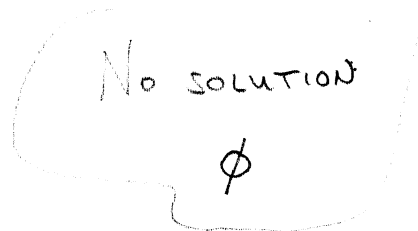
25. Solve for k. Write your solution set in interval notation, and graph it on a number line.

$$3(k - 4) + 2k > 3 \quad \text{or} \quad 7 - 2k \geq 13$$

$3k - 12 + 2k > 3$ or $-2k \geq 6$

$5k - 12 > 3$ or $k \leq -3$

$5k > 15$

$k > 3$

$(-\infty, -3] \cup (3, \infty)$

-3 3

6
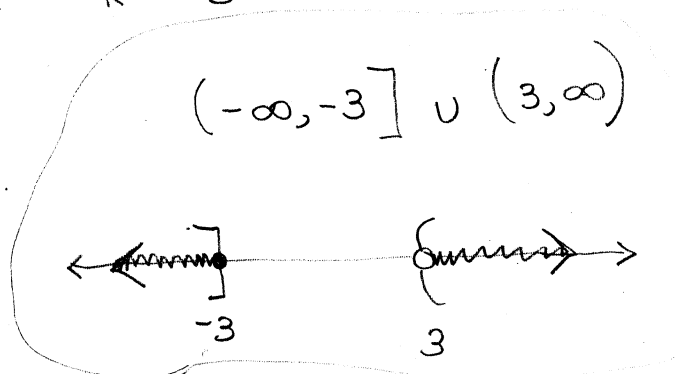
26. Solve for y. Write your solution set in interval notation, and graph it on a number line.
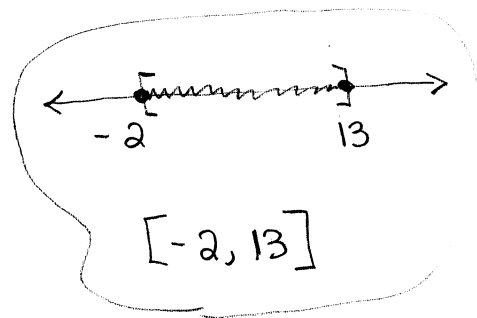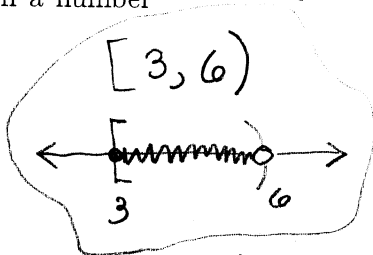
$$-4 \le \frac{2y-8}{3} \le 6$$

$-12 \le 2y - 8 \le 18$

$-4 \le 2y \le 26$

$-2 \le y \le 13$

$[-2, 13]$

27. Solve for u. Write your solution set in interval notation, and graph it on a number line.

$$2(u+2) - 3 < u + 7 \quad \text{and} \quad 7 - 2u \le 1$$

$2u + 4 - 3 < u + 7$ AND $-2u \le -6$

$2u + 1 < u + 7$ AND $u \ge 3$

$u < 6$ AND

$[3, 6)$

$u < 6$ AND $u \ge 3$

Objective: Solve application problems involving linear inequalities. (3)

28. It cost Steve $85 to make a bunch of mango salsa. He intends to sell jars of his salsa at a farmer's market for $6.50 each. How many jars must he sell in order to make a profit of at least $150?

LET X = # OF JARS STEVE MUST SELL

TO COVER COSTS AND MAKE THE PROFIT,

STEVE MUST BRING IN $85 + 150 = 235$.

$6.50X \ge 235 \Rightarrow X \ge \frac{235}{6.5} \approx 36.15$

37 OR MORE

29. That big turkey on campus needs more than 35 grams of protein per day. It gets 15 grams by eating grains and nuts, and it plans to eat crickets to get the rest. Each cricket has about 0.5 grams of protein. Let x be the number of crickets that the turkey must eat. Write an inequality involving x that describes the turkey's protein requirements. You need not solve the inequality.

$0.5X + 15 > 35$

OR

$0.5X > 20$

Objective: Solve absolute value equations. (11)

30. Solve for t: $|t| - 1.8 = -3.9$

$$|t| = -2.1$$

NOT POSSIBLE. $\boxed{\text{No SOLUTION}}$

31. Solve for r: $-8 = -\dfrac{2}{3}|r|$

$$|r| = \left(\frac{3}{2}\right)(8) = 12 \implies \boxed{\begin{array}{c} r = 12 \\ \text{or} \\ r = -12 \end{array}}$$

32. Solve for w: . $-6|2w - 7| = -12$

$$|2w - 7| = 2$$

$2w - 7 = 2$ or $2w - 7 = -2$

$2w = 9$ $2w = 5$

$\boxed{w = \dfrac{9}{2} \text{ or } w = \dfrac{5}{2}}$

33. Solve for x: $8 - |x + 6| = 12$

$$-|x + 6| = 4$$
$$|x + 6| = -4$$

$\boxed{\text{No SOLUTION}}$

NOT POSSIBLE

34. Solve for y: $|3y - 6| = |2y - 5|$

$3y - 6 = 2y - 5$ or $3y - 6 = -(2y - 5)$

$y = 1$ or $3y - 6 = -2y + 5$

$5y = 11$

$y = \dfrac{11}{5}$

$\boxed{y = 1 \text{ or } y = \dfrac{11}{5}}$

8

Objective: Solve absolute value inequalities. (11)

35. Solve for w. Write your solution set in interval notation, and graph it on a number line.

$$|-5-2w|+4>13$$

$$|5+2w|>9$$

$$5+2w>9$$
$$2w>4$$
$$w>2$$

$$5+2w<-9$$
$$2w<-14$$
$$w<-7$$

$$(-\infty,-7)\cup(2,\infty)$$
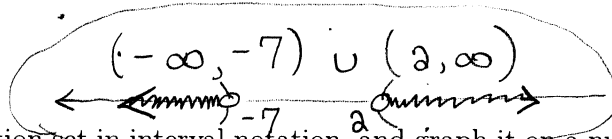
36. Solve for t. Write your solution set in interval notation, and graph it on a number line.

$$|-7+9t|+4>2$$

$$|-7+9t|>-2$$

ALWAYS TRUE!

$$(-\infty,\infty)$$
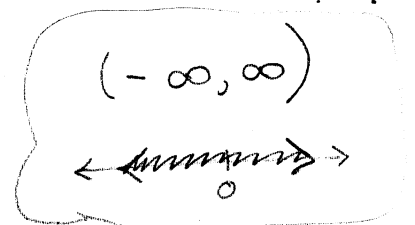
37. Solve for y. Write your solution set in interval notation, and graph it on a number line.

$$|y+2|+7<12$$

$$|y+2|<5$$

$$-5<y+2<5$$

$$-7<y<3$$

$$(-7,3)$$
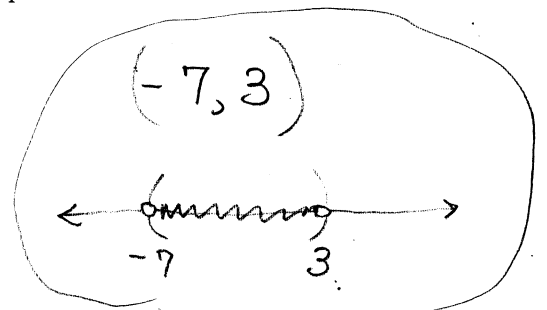
38. Solve for x. Write your solution set in interval notation, and graph it on a number line.

$$|10-4x|\le 6$$

$$-6\le 10-4x\le 6$$

$$-16\le -4x\le -4$$

$$4\ge x\ge 1$$

$$[1,4]$$

39. Solve for r. Write your solution set in interval notation, and graph it on a number line.
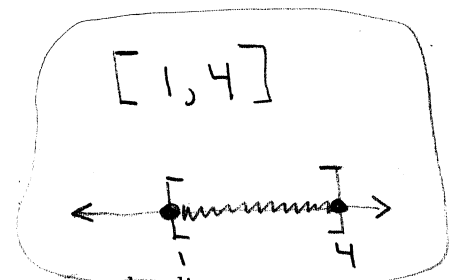
$$2-|3r+5|>8$$

$$-|3r+5|>6$$

$$|3r+5|<-6$$

No SOLUTION

NOT possible.

9

Objective: Identify and simplify complex numbers. (7,12)

40. Rewrite in terms of i and simplify as much as possible: $\sqrt{-96} = \sqrt{96}\,i = \boxed{4\sqrt{6}\,i}$

41. Rewrite in terms of i and simplify as much as possible: $\sqrt{-144} = \boxed{12i}$

42. Rewrite in terms of i and simplify as much as possible: $3 + \sqrt{-12} - 9 + \sqrt{-75}$

$$= -6 + 2\sqrt{3}\,i + 5\sqrt{3}\,i$$
$$= \boxed{-6 + 7\sqrt{3}\,i}$$

Objective: Add, subtract, multiply, and divide complex numbers. (7,12)

43. Write as a complex number in standard form: $(-3 - 6i) - (5i - 9)$

$$-3 - 6i - 5i + 9 = \boxed{6 - 11i}$$

44. Write as a complex number in standard form: $(2 - 4i)(3 + i)$

$$6 - 12i + 2i - 4i^2$$
$$6 - 10i + 4 \qquad \boxed{10 - 10i}$$

45. Write as a complex number in standard form: $(-5 + 7i)(5 - 7i)$

$$-25 + 35i + 35i - 49i^2$$
$$-25 + 70i + 49 = \boxed{24 + 70i}$$

46. Write as a complex number in standard form: $(0.3 - 0.6i)(0.3 + 0.6i)$

$$(0.3)^2 + (0.6)^2 = 0.09 + 0.36$$
$$= \boxed{0.45}$$

47. Compute the real part of $\dfrac{3 + 5i}{1 - 2i} \cdot \dfrac{1 + 2i}{1 + 2i}$

$$= \frac{3 + 5i + 6i + 10i^2}{1 + 4} = \frac{-7 + 11i}{5} \qquad \boxed{\text{REAL PART IS } -\frac{7}{5}}$$

48. Write as a complex number in standard form: $\dfrac{7 - 4i}{6 + 3i} \cdot \dfrac{6 - 3i}{6 - 3i}$

$$\frac{42 - 24i - 21i + 12i^2}{36 + 9} = \frac{30 - 45i}{45}$$
$$= \boxed{\frac{2}{3} - i}$$

Objective: Simplify powers of i. (7,12)

49. Write as a complex number in standard form: $i^{16} = \left(i^2\right)^8 = (-1)^8 = \boxed{1}$

50. Write as a complex number in standard form: $1 + i + i^2 + i^3 + i^4$

$$1 + i + (-1) + (-i) + 1 = \boxed{1}$$

51. Write as a complex number in standard form: $i^{13} = i^{12} \cdot i = \left(i^2\right)^6 \cdot i$

$$= (-1)^6 \cdot i = \boxed{i}$$

Objective: Solve quadratic equations by factoring. (7)

52. Solve for x: $\quad 5x(3x - 1) = 0$

$\boxed{X = 0 \quad \text{or} \quad X = \dfrac{1}{3}}$

53. Solve for x: $\quad 5(x - 7)(5x + 3) = 0$

$\boxed{X = 7 \quad \text{or} \quad X = -\dfrac{3}{5}}$

54. Solve for x: $\quad 3x(x + 8)(x - 2)(4x + 7) = 0$

$\boxed{X = 0, \quad X = -8, \quad X = 2, \quad \text{or} \quad X = -\dfrac{7}{4}}$

55. Solve for x: $\quad x^2 - 4x = 21$

$x^2 - 4x - 21 = 0$
$(x - 7)(x + 3) = 0$

$\boxed{X = 7 \quad \text{or} \quad X = -3}$

56. Solve for x: $\quad x^2 - 30 = x$

$x^2 - x - 30 = 0$
$(x - 6)(x + 5) = 0$

$\boxed{X = 6 \quad \text{or} \quad X = -5}$

57. Solve for x: $\quad 6x^2 - 32x - 24 = 0$

DIVIDE BY 2

$3x^2 - 16x - 12 = 0$

$pq = -36 \qquad 11$

$p + p = -16 \qquad -18, 2$

$3x^2 - 18x + 2x - 12 = 0$
$3x(x - 6) + 2(x - 6) = 0$
$(3x + 2)(x - 6) = 0$

$\boxed{X = -\dfrac{2}{3} \quad \text{or} \quad X = 6}$

Objective: Solve quadratic equations by square roots. (This includes completing the square.) (6)

58. Solve for x. Write your solution(s) in exact form, simplified as much as possible.

$$(x-2)^2 = 8$$

$x - 2 = \pm\sqrt{8} = \pm 2\sqrt{2}$

$\boxed{x = 2 \pm 2\sqrt{2}}$

59. Solve for x. Write your solution(s) in exact form, simplified as much as possible.

$$(3x-1)^2 = 9$$

$3x - 1 = \pm 3$

$3x = 4$ or $3x = -2$

$\boxed{x = 4/3 \quad \text{or} \quad x = -2/3}$

60. Solve for x. Write your solution(s) in exact form, simplified as much as possible.

$\boxed{\begin{array}{l} x = 2 + \frac{5}{3}\sqrt{3} \\ \text{or} \\ x = 2 - \frac{5}{3}\sqrt{3} \end{array}}$

$$(3x-6)^2 - 75 = 0$$

$3x - 6 = \pm\sqrt{75} = \pm 5\sqrt{3}$

$3x = 6 \pm 5\sqrt{3}$

$x = \dfrac{6 \pm 5\sqrt{3}}{3}$

61. What number must be added to both sides of the equation so that the left hand side is a complete square?

$$x^2 + 5x = 12$$

$\left(\dfrac{5}{2}\right)^2 = \boxed{\dfrac{25}{4}}$

62: Solve for x. Write your solution(s) in exact form, simplified as much as possible.

$$x^2 + 2x + 1 = 12$$

$(x+1)^2 = 12$

$x + 1 = \pm\sqrt{12} = \pm 2\sqrt{3}$

$\boxed{x = -1 \pm 2\sqrt{3}}$

63. What number must be added to both sides of the equation so that the left hand side is a complete square?

$$x^2 - 16x = 10$$

$(-8)^2 = \boxed{64}$

12

Objective: Solve quadratic equations by using the quadratic formula. (7)

64. Use the discriminant to determine nature of the solutions. Do not solve the equation.

$$5x^2 - 13x + 1 = 0$$

$b^2 - 4ac$

$= (-13)^2 - 4(5)(1) = 169 - 20 = 149 \implies$ Two Real Solutions

65. Use the discriminant to determine nature of the solutions. Do not solve the equation.

$$x^2 - 4x + 4 = 0$$

$b^2 - 4ac$

$= (-4)^2 - 4(1)(4) = 16 - 16 = 0 \implies$ One Real Solution

66. Given the quadratic equation $3 - 6x^2 = -13x$, determine the value of the discriminant.

$6x^2 - 13x - 3 = 0$

$b^2 - 4ac = (-13)^2 - 4(6)(-3) = 169 + 72 = 241$

67. Suppose you correctly solved a quadratic equation, and you found that it has exactly one real solution. What can you say about the value of the discriminant?

Disc = 0

68. In her algebra class, Chunhua correctly solved a quadratic equation with real coefficients, and she found two complex solutions. Which of these must be true? Circle all that apply.

(a) The value of the discriminant must be positive.

(b) The two solutions must be complex conjugates.

(c) The value of the discriminant must be zero.

(d) The leading coefficient in her equation must be negative.

(e) The two solutions must be identical.

13

$$\sqrt{80} = \sqrt{16 \cdot 5}$$

69. Solve for x. Write your solution(s) in exact form, simplified as much as possible.

$$3x^2 - 2x + 7 = 0$$

$$X = \frac{2 \pm \sqrt{4 - 4(3)(7)}}{2(3)} = \frac{2 \pm \sqrt{-80}}{6} = \frac{2 \pm 4\sqrt{5}\, i}{6}$$

$$X = \frac{1 \pm 2\sqrt{5}\, i}{3}$$

70. Solve for x. Write your solution(s) in exact form, simplified as much as possible.

$$2x^2 - 3x - 4 = 0$$

$$X = \frac{3 \pm \sqrt{9 - 4(2)(-4)}}{2(2)}$$

$$= \frac{3 \pm \sqrt{41}}{4}$$

$$X = \frac{3 \pm \sqrt{41}}{4}$$

71. Solve for x. Write your answer(s) in decimal form, rounded to the nearest hundredth.

$$5x^2 - x - 3 = 0$$

$$X = \frac{1 \pm \sqrt{1 - 4(5)(-3)}}{2(5)}$$

$$= \frac{1 \pm \sqrt{61}}{10}$$

$$\frac{1 + \sqrt{61}}{10} \approx 0.88$$

$$\frac{1 - \sqrt{61}}{10} \approx -0.68$$

72. A ball is thrown from a height of 250 feet with an initial downward velocity of 20 feet per second. The height of the ball (in meters) after t seconds is given by $h = 250 - 20t - 16t^2$. When does the ball hit the ground? Round your answer to the nearest hundredth.

$$250 - 20t - 16t^2 = 0$$

$$16t^2 + 20t - 250 = 0$$

$$t = \frac{-20 \pm \sqrt{400 - 4(16)(-250)}}{2(16)} = \frac{-20 \pm \sqrt{16400}}{32}$$

$$\frac{-20 + \sqrt{16400}}{32}$$

$$\approx$$

$$3.38 \text{ sec}$$

14

Objective: Determine the values of the variable that are restricted from a rational expression. (1,11)

73. Determine the value of r that is restricted from the following expression: $\dfrac{2r - 4}{7r + 14}$

$$7r + 14 = 0$$
$$\Rightarrow \boxed{r = -2}$$

74. Determine the values of w that are restricted from the following expression: $\dfrac{w}{w^2 - 2w - 3}$

$$w^2 - 2w - 3 = 0$$
$$(w - 3)(w + 1) = 0$$
$$\boxed{w = 3 \quad \text{or} \quad w = -1}$$

75. Determine the values of x that are restricted from the following expression: $\dfrac{x^2 - 1}{x(3x - 2)(x + 1)}$

$$x(3x - 2)(x + 1) = 0$$
$$\boxed{x = 0, \quad x = \tfrac{2}{3}, \quad x = -1}$$

76. Which values of x are restricted from being possible solutions? Do not actually solve.

$$4 - \frac{x}{x - 1} = \frac{7}{(x - 1)(x - 13)}$$

$$\boxed{x = 1, \quad x = 13}$$

Objective: Solve rational equations that reduce to linear or quadratic. (3,7,11)

77. Solve for x: $\dfrac{21}{x} = \dfrac{30}{x + 3}$

$$21(x + 3) = 30x$$
$$21x + 63 = 30x$$
$$63 = 9x$$
$$\boxed{x = 7}$$

15

78. The reciprocal of a number, x, is 5 more than twice the number. Determine the number x.

$$\frac{1}{x} = 2x + 5$$

$$1 = 2x^2 + 5x$$

$$2x^2 + 5x - 1 = 0$$

$$X = \frac{-5 \pm \sqrt{25 - 4(2)(-1)}}{2(2)}$$

$$\boxed{X = \frac{-5 \pm \sqrt{33}}{4}}$$

79. Solve for v: $4 + \dfrac{7}{v-7} = \dfrac{v}{v-7}$

$$4(v-7) + 7 = V$$

$$4v - 28 + 7 = V$$

$$3v = 21 \implies V = 7 \quad \text{RESTRICTED.} \quad \boxed{\text{No SOLUTION}}$$

80. Solve for x: $\dfrac{x+8}{x+3} = \dfrac{10}{2x+6}$

$\underbrace{}_{2(x+3)}$

$$2(x+8) = 10$$

$$2x + 16 = 10$$

$$2x = -6$$

$$X = -3 \quad \text{RESTRICTED.} \quad \boxed{\text{No SOLUTION}}$$

81. Solve for v: $-\dfrac{4}{v-2} = \dfrac{8}{5v-10} - 3$

$\underbrace{}_{5(v-2)}$

$$-4(5) = 8 - 3(5)(v-2)$$

$$-20 = 8 - 15v + 30$$

$$15v = 58$$

$$\boxed{V = \frac{58}{15}}$$

82. Solve for x: $x + \dfrac{21}{x} = \dfrac{57}{x}$

$$x^2 + 21 = 57$$

$$X = 36$$

$$\boxed{X = \pm 6}$$

16

83. Solve for u: $\dfrac{2}{(u-1)(u-2)} = 3 + \dfrac{2}{u-2}$

$2 = 3(u-1)(u-2) + 2(u-1)$

$2 = 3u^2 - 9u + 6 + 2u - 2$

$2 = 3u^2 - 7u + 4$

$3u^2 - 7u + 2 = 0$

$(3u - 1)(u-2) = 0$

$\boxed{u = \frac{1}{3}}$ OR $u = \cancel{2}$

RESTRICTED

84. Solve for x: $\dfrac{3}{x-5} + \dfrac{2}{x^2-25} = \dfrac{1}{x+5}$

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

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

$3x + 15 + 2 = x - 5$

$2x = -22$

$\boxed{x = -11}$

Objective: Solve equations using odd roots. (11)

85. Solve for x: $(x-7)^3 = 27$

$x - 7 = 3$

$\boxed{x = 10}$

86. Solve for x. Write your solution(s) in exact form, simplified as much as possible.

$$(x-1)^3 - 5 = 11$$

$(x-1)^3 = 16$

$x - 1 = 2\sqrt[3]{2}$

$\boxed{x = 1 + 2\sqrt[3]{2}}$

87. Solve for x. Round your answer(s) to the nearest hundredth.

$$(2x)^3 - 25 = 0$$

$(2x)^3 = 25$

$2x = \sqrt[3]{25}$

$x = \dfrac{\sqrt[3]{25}}{2} \approx \boxed{1.46}$

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