Math 109 - Test 1B

February 13, 2020

Name __key__

Score _____

Show all work to receive full credit. Supply explanations where necessary.

1. (4 points [3]) Which of these equations ARE linear equations? Circle all that apply.

$$\frac{x+5}{6} + 3 = \frac{x}{7}, \qquad 4x = 7(2-x), \qquad (3x+2)^{3/2} = 4, \qquad 3x(x-8) = x$$

(first two circled)

2. (3 points [3]) Solve for x: $5x - 12 = 9$

$5x = 21$

$x = \dfrac{21}{5}$

3. (4 points [3]) Solve for y: $\dfrac{3y-6}{-7} = 6$

$3y - 6 = -42$

$3y = -36$

$y = -12$

4. (4 points [3]) Yesterday, David rode his bike at the speed of 15 miles per hour. Today, he rode at 12 miles per hour. In the two days, he biked for a combined total time of 7 hours. Let x be the number of hours he biked yesterday. Write an algebraic expression in terms of the single variable x that gives the total number of miles he biked in the two days. (Remember that *distance equals rate times time.*)

$x =$ HOURS YESTERDAY

$7-x =$ HOURS TODAY

$15x =$ MILES YESTERDAY

$12(7-x) =$ MILES TODAY

TOTAL MILES $= 15x + 12(7-x)$

or $3x + 84$

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5. (3 points [3]) Solve for x: $6 - 9x \geq 51$

$$-9x \geq 45$$

$$\boxed{x \leq -5}$$

6. (4 points [3]) Solve for w: $6w - (7 - 2w) = 4(w - 2) + 4w + 1$

$$6w - 7 + 2w = 4w - 8 + 4w + 1$$

$$8w - 7 = 8w - 7$$

$$\text{IDENTITY} \Rightarrow \boxed{\text{ALL NUMBERS ARE SOLUTIONS.}}$$

7. (3 points [3]) In a work zone on a certain highway, you cannot drive slower than 30 mph and you cannot drive faster than 45 mph. Use x to represent speed (in mph), and write an inequality that describes the speeds you can drive.

$$\left.\begin{array}{c} x \geq 30 \\ \text{AND} \\ x \leq 45 \end{array}\right\} \qquad \boxed{30 \leq x \leq 45}$$

8. (5 points [3]) Solve for y. Write your solution set in interval notation, and graph it on a number line.

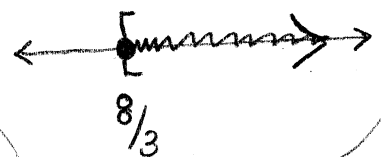$$8y + 14 \leq 2(3 + 2y) + 7y$$

$$8y + 14 \leq 6 + 4y + 7y$$

$$8y + 14 \leq 6 + 11y$$

$$8 \leq 3y$$

$$\frac{8}{3} \leq y \longrightarrow \boxed{\begin{array}{c} y \geq \frac{8}{3} \\[2mm] \left[\frac{8}{3}, \infty\right) \\[2mm] \end{array}}$$

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9. (4 points [3]) Solve for x: $5x + 9 > \frac{5}{2}(4 + 2x)$

$$5x + 9 > 10 + 5x$$

$$9 > 10$$

. Never !

No solution

10. (6 points [3]) Solve for y. Write your solution set in interval notation, and graph it on a number line.

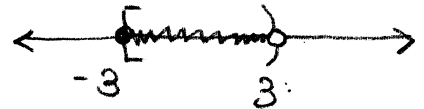$$3(y - 4) + 2y < 3 \qquad \text{and} \qquad 7 - 2y \le 13$$

$$3y - 12 + 2y < 3 \qquad\qquad -2y \le 6$$

$$5y - 12 < 3 \qquad\qquad\qquad y \ge -3$$

$$\cdot\; 5y < 15 \qquad\qquad \text{AND}$$

$$y < 3$$

$y \ge -3$ AND $y < 3$

$-3 \le y < 3$

$[-3, 3)$

11. (3 points [3]) Kate Jindo sells her famous, craft hot sauce for $9 per bottle. Let b represent the number of bottles that Kate will sell at the farmer's market. Kate would like to make at least $400. Write an inequality involving b that Kate could solve to determine the numbers of bottles she must sell.

$$9b \ge 400$$

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12. (4 points [7]) Solve for x: $3(8x - 3)(x + 6) = 0$

$$8x - 3 = 0 \quad \text{or} \quad x + 6 = 0$$

$$\boxed{x = 3/8 \quad \text{or} \quad x = -6}$$

13. (4 points [1,9]) Determine the values of x that are restricted from the following expression: $\dfrac{x - 9}{x^2 + 4x - 21}$

$$(x + 7)(x - 3) = 0$$

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

14. (4 points [1,3,9]) Solve for y: $\dfrac{5}{y - 4} = \dfrac{8}{y}$

$$5y = 8(y - 4)$$

$$5y = 8y - 32$$

$$-3y = -32$$

$$\boxed{y = \frac{32}{3}}$$

15. (4 points [1,3,9]) Solve for x: $7 - \dfrac{4}{x + 4} = \dfrac{x}{x + 4}$

Mult by $x + 4$ ...

$$7(x + 4) - 4 = x$$

$$7x + 28 - 4 = x$$

$$7x + 24 = x$$

$$6x = -24$$

$$\cancel{x = -4}$$

$x = -4$ IS A RESTRICTED VALUE.

$$\boxed{\text{No Solution}}$$

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16. (5 points [7]) Solve for t: $t^2 + 2t - 13 = 2$

$$t^2 + 2t - 15 = 0$$

$$(t + 5)(t - 3) = 0$$

$$\boxed{t = -5, \quad t = 3}$$

17. (4 points [9]) Solve for u: $13 + \sqrt{5u + 1} = 4$

$$\sqrt{5u + 1} = -9$$

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

18. (5 points [9]) Solve for x. Round your final answer(s) to the nearest hundredth.

$$\sqrt[3]{2x + 5} - 3 = 0$$

$$\sqrt[3]{2x + 5} = 3$$

$$2x + 5 = 3^3 = 27$$

$$\underbrace{\qquad\qquad}$$

$$2x = 22 \quad \longrightarrow \quad \boxed{X = 11}$$

19. (6 points [7]) Solve for x. Write your final answer(s) in decimal form, rounded to the nearest hundredth.

$$2x^2 - 3x - 1 = 0$$

QUADRATIC FORMULA ---

$$a = 2, \quad b = -3, \quad c = -1$$

$$X = \frac{3 \pm \sqrt{(-3)^2 - 4(2)(-1)}}{2(2)} = \frac{3 \pm \sqrt{9 + 8}}{4} = \frac{3 \pm \sqrt{17}}{4} \approx \boxed{1.78 \text{ or } -0.28}$$

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20. (3 points [9]) The following equation is "quadratic in form." In order to solve it, what substitution would be most helpful? (Do not solve the equation.)

$$(x^3 + 1)^2 + 3(x^3 + 1) + 2 = 0$$

$$\boxed{u = x^3 + 1}$$

THIS MAKES $u^2 + 3u + 2 = 0$

21. (4 points [9]) Solve for v: $(3v - 7)^{1/5} - 1 = 1$

$$\sqrt[5]{3v - 7} = 2$$
$$3v - 7 = 32$$
$$3v = 39$$

$$\boxed{v = 13}$$

22. (4 points [9]). Solve for x. Round your answer(s) to the nearest hundredth.

$$(x - 2)^3 + 15 = 3$$

$$(x-2)^3 = -12$$
$$x - 2 = \sqrt[3]{-12}$$
$$\boxed{x = \sqrt[3]{-12} + 2 \approx -0.29}$$

23. (10 points [3,7,9]) Solve for x: $\dfrac{6}{(x-1)(x-3)} = 1 + \dfrac{3}{x-3}$

MULT BY $(x-1)(x-3) \cdots$

$$6 = (x-1)(x-3) + 3(x-1)$$

$$6 = x^2 - 4x + 3 + 3x - 3$$
$$6 = x^2 - x$$
$$x^2 - x - 6 = 0$$
$$(x-3)(x+2) = 0$$

$\cancel{x=3}$ or $\boxed{x = -2}$

$x = 3$ IS A RESTRICTED VALUE.

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