

Math 129 - Test 1A
February 19, 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.

$$\frac{6}{x+5} + 3 = \frac{1}{x}$$

RATIONAL

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

$$x(x-6) = 0$$

QUADRATIC

$$\frac{2x}{3} + \frac{1}{6} = x$$

2. (3 points [3]) Solve for x : $4(x-5) + 2x = 3(x-1) + 10$

$$4x - 20 + 2x = 3x - 3 + 10$$

$$6x - 20 = 3x + 7$$

$$3x = 27$$

$$x = 9$$

3. (3 points [3]) Solve for w : $\frac{12-6w}{5} = 6$

$$12 - 6w = 30$$

$$-6w = 18$$

$$w = -3$$

4. (4 points [3]) Yesterday, David rode his bike at the speed of 10 miles per hour. Today, he rode at 14 miles per hour. In the two days, he biked for a combined total time of 9 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*.)

$$x = \text{HOURS BIKED YESTERDAY} \Rightarrow 10x = \text{MILES BIKED YESTERDAY}$$

$$9-x = \text{HOURS BIKED TODAY} \Rightarrow 14(9-x) = \text{MILES BIKED TODAY}$$

↑
TOTAL OF 9 HOURS

$$\begin{aligned} \text{TOTAL MILES} &= 10x + 14(9-x) \\ &= 126 - 4x \end{aligned}$$

5. (3 points [3]) Solve for r : $3r - (5 - 2r) = 3(r - 2) + 2r + 2$

$$3r - 5 + 2r = 3r - 6 + 2r + 2$$

$$5r - 5 = 5r - 4$$

$$-5 = -4 \quad \text{CONTRADICTION.}$$

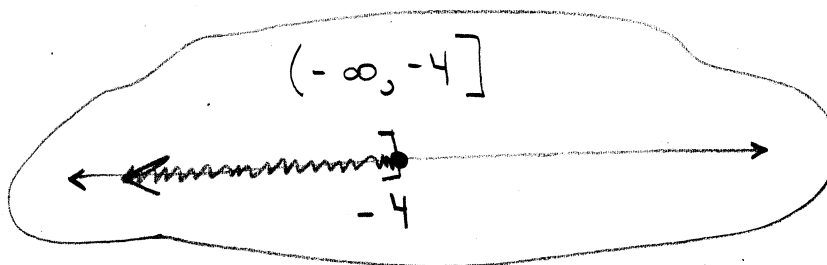
No solution

6. (5 points [3]) Solve for x . Write your solution set in interval notation, and graph it on a number line.

$$4 - 7x \geq 32$$

$$-7x \geq 28$$

$$x \leq -4$$



7. (5 points [3]) Solve for y . Write your solution set in interval notation, and graph it on a number line.

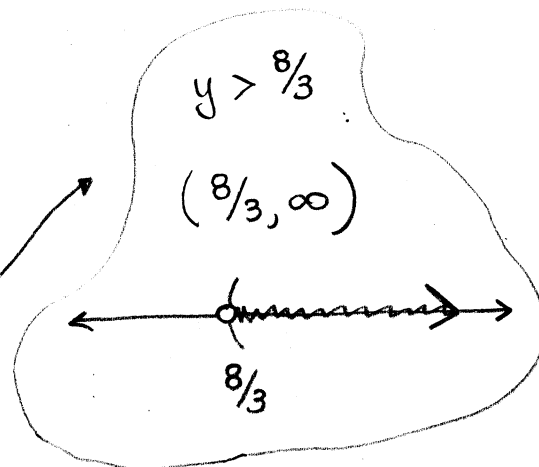
$$8y + 14 < 2(3 + 2y) + 7y$$

$$8y + 14 < 6 + 4y + 7y$$

$$8y + 14 < 11y + 6$$

$$8 < 3y$$

$$\frac{8}{3} < y$$



8. (3 points [3]) Solve for x : $3x + 13 > \frac{3}{2}(4 + 2x)$

$$3x + 13 > \frac{12}{2} + \frac{6x}{2}$$

$$3x + 13 > 6 + 3x$$

$$13 > 6 \quad \text{Always!}$$

All numbers are solutions.

9. (6 points [3]) Solve for y . Write your solution set in interval notation, and graph it on a number line.

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

$$3y - 12 + 2y < 3 \quad -2y \leq 6$$

$$5y - 12 < 3$$

$$y \geq -3$$

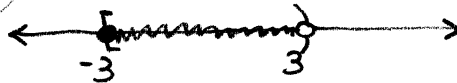
$$5y < 15$$

AND

$$y < 3$$

$$-3 \leq y < 3$$

$$[-3, 3)$$



10. (4 points [3]) Kate sells her craft hot sauce at the local farmer's market. It costs her \$150 to rent a booth, and she sells the sauce for \$8 per bottle. Let b represent the number of bottles that Kate will sell. Suppose she would like to take home at least \$400. Write an inequality involving b that Kate could solve to determine the numbers of bottles she must sell.

$$\left(\begin{array}{c} \text{AMOUNT FOR} \\ \text{SAUCE} \end{array} \right) - \left(\text{RENT} \right) = \text{AT LEAST } \$500$$

$$8b - 150 \geq 400$$

11. (4 points [11]) Solve for x : $-2|3x - 1| + 5 = -7$

$$-2|3x - 1| = -12$$

$$|3x - 1| = 6$$

$$3x - 1 = 6 \quad \text{or} \quad 3x - 1 = -6$$

$$3x = 7$$

$$3x = -5$$

$$x = \frac{7}{3}$$

or

$$x = -\frac{5}{3}$$

12. (2 points [11]) Solve for t : $|t + 6| = -4$

ABS. VALUE CANNOT BE NEGATIVE

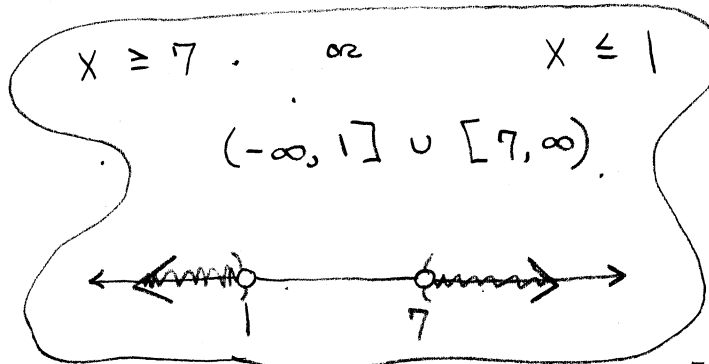
No solution

13. (6 points [11]) Solve for x . Write your solution set in interval notation, and graph it on a number line.

$$|8 - 2x| \geq 6$$

$$8 - 2x \leq -6 \quad \text{or} \quad 8 - 2x \geq 6$$

$$-2x \leq -14 \quad \quad \quad -2x \geq -2$$



14. (4 points [7,12]) Write as a complex number in standard form: $\frac{7+4i}{2-i}$

$$\frac{7+4i}{2-i} \cdot \frac{2+i}{2+i} = \frac{(7+4i)(2+i)}{(2-i)(2+i)} = \frac{14 + 15i + 4i^2}{4+1}$$

$$= \frac{10 + 15i}{5} = \boxed{2+3i}$$

15. (3 points [7,12]) Write as a complex number in standard form: i^{29}

$$i^{29} = i^{28+1} = i^{28} \cdot i = 1 \cdot i = \boxed{i}$$

16. (3 points [7]) Solve for x : $4(x+2)(7x+2) = 0$

$$x+2=0 \quad \text{or} \quad 7x+2=0$$

$$\boxed{x=-2 \quad \text{or} \quad x=-\frac{2}{7}}$$

17. (4 points [7]) Solve for x : $x^2 = 3x + 18$

$$x^2 - 3x - 18 = 0$$

$$(x-6)(x+3) = 0$$

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

18. (3 points [6]) Complete the square: $x^2 + 6x + 2$

$$\frac{6}{2} = 3 \quad (x+3)^2 - 9 + 2 = (x+3)^2 - 7$$

19. (5 points [7]) Solve for x . Write your solution(s) in exact form, simplified as much as possible.

$$3x^2 - 2x + 1 = 0 \quad \sqrt{8} = 2\sqrt{2}$$

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

$$x = \frac{2 \pm \sqrt{4 - 4(3)(1)}}{2(3)} = \frac{2 \pm \sqrt{-8}}{6} = \frac{2 \pm 2\sqrt{2}i}{6}$$

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

20. (6 points [7]) A ball is thrown from a height of 60 meters with an initial downward velocity of 3 meters per second. The height of the ball (in meters) after t seconds is given by $h = 60 - 3t - 4.9t^2$. When does the ball hit the ground? Round your answer to the nearest hundredth.

$$h = 0 \Rightarrow 60 - 3t - 4.9t^2 = 0$$

$$a = -4.9, b = -3, c = 60$$

$$t = \frac{3 - \sqrt{1185}}{-9.8}$$

$$t = \frac{3 \pm \sqrt{9 - 4(-4.9)(60)}}{2(-4.9)}$$

$$= \frac{3 \pm \sqrt{1185}}{-9.8}$$

$$\approx 3.21 \text{ sec}$$

21. (3 points [7]) Use the discriminant to determine a value for a so that the equation has exactly one real solution.

$$b^2 - 4ac = 0 \quad ax^2 + 7x + 4 = 0$$

$$a = a, b = 7, c = 4$$

$$b^2 - 4ac = 49 - 4a(4) = 49 - 16a = 0$$

$$a = \frac{49}{16}$$

22. (3 points [1,11]) Determine the values of x that are restricted from the following expression:

$$\frac{x-6}{x^2+2x-15}$$

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

$$x = -5, x = 3$$

23. (4 points [3,7,11]) Solve for u : $\frac{5}{u} = \frac{8}{u-7}$

Cross multiply...

$$5(u-7) = 8u$$

$$5u - 35 = 8u$$

$$-35 = 3u$$

$$u = \frac{-35}{3}$$

24. (6 points [3,7,11]) Solve for x : $\frac{6}{(x-1)(x-3)} = 1 + \frac{3}{x-3}$

MULT. BY $(x-1)(x-3)$ TO

CLEAR FRACTIONS...

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

$$6 = x^2 - 4x + 3 + 3x - 3$$

$$6 = x^2 - x$$

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

$$x-3 = 0 \quad \text{or} \quad x+2 = 0$$

~~$$x = 3$$~~

$$x = -2$$

$x=3$ IS A
RESTRICTED
VALUE!

25. (4 points [11]) Solve for x . Round your answer(s) to the nearest hundredth.

$$(3x-2)^5 - 36 = 0$$

$$(3x-2)^5 = 36$$

$$3x-2 = \sqrt[5]{36}$$

$$3x = 2 + \sqrt[5]{36}$$

$$x = \frac{2 + \sqrt[5]{36}}{3} \approx 1.35$$