

NAME: _____ Score _____ /100

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SHOW ALL YOUR WORK IN A NEAT AND ORGANIZED FASHION

Course Average _____

No Decimals No mixed numbers No complex fractions No boxed or circled answers**Questions 1 – 40 are each worth one-half point.**

1. T **F** A linear equation in one variable is an equation which can be written in the form $y = mx + b$.
2. T **F** Addition is a unary operation.
3. **T** F Two equations are equivalent if they have the same solution sets.
4. T **F** The expression $3x + 7$ has a solution set.
5. T **F** $\{3,4,8\} \cup \{2, 5, 6,7\} = [2, 8]$
6. **T** F The interval $[-2, 0]$ contains rational numbers and irrational numbers.
7. T **F** If A, B, and C are the solution sets of a linear equation in one variable and its two corresponding inequalities, then $A \cap B \cap C = R$.
8. **T** F If A, B, and C are the solution sets of a linear equation in one variable and its two corresponding inequalities, then $A \cup B \cup C = R$.
9. **T** F If $3x + 5$ is added to both sides of an equation, the new equation is equivalent to the original equation.
10. T **F** $\{2, 3\} \subset (2, 3)$
11. T **F** To say 3 is a solution of an equation means the same as saying $\{3\}$ is the solution set for that equation.
12. **T** F An equation is a mathematical statement which contains an = symbol.
13. **T** F The product of a complex number and its conjugate is its norm.
14. **T** F Both the real component and the complex component of a complex number are real numbers.
15. T **F** The complex component of a complex number is a complex number.
16. A formula must be an **equation**.
17. A binary relation is a **comparison** of two operands.
18. When considering an equation $3x^2 + 5x + 7 = 0$ we should also consider its siblings **$3x^2 + 5x + 7 < 0$** and **$3x^2 + 5x + 7 > 0$** .
19. Definitions in mathematics are **stipulative**
20. In mathematics we use **deductive** reasoning.
21. The graph of an equation in **one** variable is drawn on the Real number line.
22. The graph of an equation consists of all the points, and only those points, whose coordinates are **solutions** of the equation.
23. An equation is frequently called the **boundary** equation because its graph forms a **boundary** between the graphs of the corresponding inequalities.
24. A conditional equation is an equation which is **true** when some real numbers are substituted for the variables and is **false** when some real numbers are substituted for the variables.
25. Write the conjugate of $-2 - 4i$ **$-2 + 4i$**
26. What is the complex component of $\frac{4}{3} - \frac{5}{9}i$

27. $A = \{1, 2, 3, 4, 5\}$ and B is the interval $(2, 4]$, then $A \cap B = \{3, 4\}$ Use set notation.
28. The process to solve a linear equation in one variable is to generate a sequence of equations each **equivalent** to the previous equation until a simplest equation is obtained.
29. Write the formula for the area of a triangle $A = \frac{1}{2}bh$
30. The linear equation $x - 5 = 0$ and the quadratic equation $x^2 - 10x + 25 = 0$ have the same solution set $\{5\}$. Therefore the two equations are **equivalent**
31. Write the formula for the area of a circle $A = \pi r^2$
32. Write the opposite of $-3 + 2i$? $3 - 2i$
33. Write the norm of $3 + 5i$? $3^2 + 5^2$
34. $\mathbb{N} \cap (-3, 5] = \{1, 2, 3, 4, 5\}$
35. Write set builder notation for the set of real numbers described as the interval from a to b which contains a but does not contain b . $\{x \mid a \leq x < b\}$
36. Use interval notation to write the set $\{x \mid -2 < x \leq 5\}$ $(-2, 5]$.
37. The phrase “to factor” means to write as a **product**
38. Transitive Property: If a , b , and c are real numbers such that $a = b$ and $b = c$, then $a = c$
39. To convert a subtraction problem to an addition problem one adds the minuend and the **opposite** of the **subtrahend**.
40. The set of integers is a subset of the set of rational numbers.

For Questions 41 – 50 each part is worth one-half point

In the following multiple choice questions, any number of choices may be correct. In each question at least one choice is correct. **Circle ALL correct choices.**

41. Which of the following are linear equations in one variable?
- a. $5x + 1 + 2x + 12$
 - b. $x + 7 < 2x + 12$
 - c. $x^2 = 3$
 - d. $x + 5 = 2x$
 - e. $\frac{2x}{5} + \sqrt{3} = \frac{3}{\sqrt{2}}x$
 - f. $\frac{2x - 3}{4} = \frac{5 - 7x}{6}$
 - g. $\sqrt{8} = x$
 - h. $\frac{x - 3}{4} = \frac{2 - 3x}{x}$
 - i. $8 = \sqrt{x}$
 - j. $\sqrt{3x + 1} + 8 = x$

42. The graph of a conditional linear equation in one variable:

- a. Is on the number line
- b. Is in the Cartesian coordinate system
- c. Is a line
- d. Is a dot
- e. Is an interval
- f. Is a ray

43. If both sides of an equation are multiplied by a (the same) positive real number:

- a. The resulting equation is equivalent to the original equation.
- b. The two equations have the same solution sets.
- c. The two equations might have different solution sets.
- d. The two equations are equal.
- e. The resulting equation is a simplest equation.

44. If the number k cannot be written as a quotient (fraction) of integers, then k is

a. a Natural Number b. a Whole Number c. an Integer	d. a Rational Number e. an Irrational Number f. A Real Number
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45. If the number k can be written as a quotient (fraction) of integers with non-zero denominator, then k is

a. a Natural Number b. a Whole Number c. an Integer	d. a Rational Number e. an Irrational Number f. A Real Number g. A Real Number
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46. The solution set of an identity equation in one variable may be

a. The empty set b. A set containing one number c. A set containing two numbers	d. We must solve the equation to figure out how many solutions there are e. All real numbers \mathbf{R}
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47. If the solution set for an equation is the empty set, then

a. The equation is an identity b. The equation is a conditional equation c. The equation is a contradiction	d. The equation has no solution e. Every Real number is a solution
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48. If both sides of an equation are multiplied by a non-zero real number

- a. the resulting equation is equivalent to the original equation.
- b. the two equations have the same solution sets.
- c. the two equations might have different solution sets.
- d. the two equations are equal.
- e. the resulting equation is a simplest equation.

49. If both sides of an inequality are multiplied by a non-zero real number

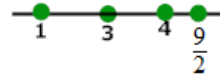
- a. the resulting inequality is equivalent to the original equation.
- b. the two inequalities have the same solution sets.
- c. the two inequalities might have different solution sets.
- d. the two inequalities are equal.
- e. the resulting inequality is a simplest equation.

50. Consider the inequality $4x^3 + 5x^2 - 7x + 19 < -11$. Suppose S is its solution set. Assume that a true statement results if the real number k is substituted into the inequality $4x^3 + 5x^2 - 7x + 19 < -11$. Which of the following are true statements?

<p>a. k is a solution of $4x^3 + 5x^2 - 7x + 19 < -11$.</p> <p>b. k is a solution of $4x^3 + 5x^2 - 7x + 19 = -11$.</p> <p>c. $k \in S$</p> <p>d. $k \notin S$</p>	<p>e. $\{k\} \subset S$</p> <p>f. $\{k\} = S$</p> <p>g. $k \subset S$</p> <p>h. $\{k\} \in S$</p>
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Questions 51 – 60 are each worth 5 points.

51. The graph of an equation in one variable is shown below. What is the solution set for that equation?



$$\left\{1, 3, 4, \frac{9}{2}\right\}$$

52. Suppose $A = \{1, 2, 3, 4, 5\}$

a. Write all subsets of A which have no elements **There is one subset with no elements \emptyset**

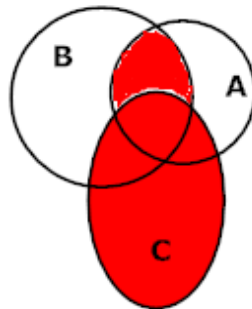
b. Write all subsets of A which have 3 elements

$$\{1, 2, 3\}, \{1, 2, 4\}, \{1, 2, 5\}, \{1, 3, 4\}, \{1, 3, 5\}, \{1, 4, 5\},$$

$$\{2, 3, 4\}, \{2, 3, 5\}, \{2, 4, 5\},$$

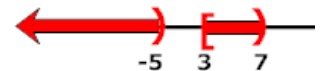
$$\{3, 4, 5\}$$

53. In the Venn diagram below, shade $(A \cap B) \cup C$



54. The graph of an inequality in one variable is shown at the right. What is the solution set for that inequality? Use Interval notation.

$$(-\infty, -5) \cup [3, 7)$$



55. Complete the statement of The Law of Trichotomy

If a and b are real numbers then exactly one of the following is true:

i. $a < b$

ii. $a = b$

iii. $a > b$

56. Compute the multiplicative inverse of $5 - 3i$.

$$\frac{5 + 3i}{5^2 + 3^2} = \frac{5 + 3i}{34}$$

57. Compute the product $(2 + i)(3 - 5i) = 6 - 10i + 3i - 5i^2 = 11 - 7i$

58. Change the difference $(3 - 5i) - (2 - 6i)$ to an addition problem (do not bother computing either the difference or the sum). $(3 - 5i) - (2 - 6i) = (3 - 5i) + (-2 + 6i)$

This could be written vertically with arrows.

59. Change the quotient $(3 - 5i) \div (2 - 6i)$ to a multiplication problem (do not bother computing either the product or the or the quotient).

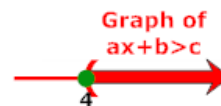
$$(3 - 5i) \div (2 - 6i) = (3 - 5i) \left(\frac{2 + 6i}{2^2 + 6^2} \right) = (3 - 5i) \left(\frac{2 + 6i}{40} \right)$$

60. The graph of a particular linear equation $ax + b = c$ in one variable is

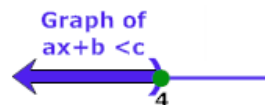
It is also known that 0 is not a solution of $ax + b > c$



a. Sketch the graph of $ax + b > c$ on this number line



b. Sketch the graph of $ax + b < c$ on this number line



c. Use interval notation to write the solution set for $ax + b > c$ $(4, \infty)$

d. Use set builder notation to write the solution set for $ax + b < c$ $\{x \mid x < 4\}$

e. Use the roster method to write the solution set for $ax + b = c$ $\{4\}$