

NAME: \_\_\_\_\_ Score \_\_\_\_\_/100

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SHOW ALL YOUR WORK IN A NEAT AND ORGANIZED FASHION

Circle T or F, whichever is correct.

Questions 1 -22 are 3 pts. each. Questions 23 – 29 are 5 pts. each.

1. **T** F the norm of a complex number is a real number.
2. T **F**  $\{x | 2 < x < 7\} = \{2, 7\}$
3. **T** F 3 is a solution of  $x^3 + x^2 - 2x = 30$
4. **T** F If  $2x^2 - 5$  is added to both sides of an equation, the resulting equation is equivalent to the original.
5. **T** F A formula must be an equation.

Circle the symbol for the smallest set of numbers which contains the number given at the left.

The Symbols are standard: **R** is the real numbers, **F** is the irrational numbers, **Q** is the rational numbers, **Z** is the integers, **W** is the whole numbers, and **N** is the natural numbers.

6. The smallest set which contains  $-3 + \sqrt{8}$  is **R F Q Z W N**
7. The smallest set which contains  $\frac{14}{5}$  is **R F Q Z W N**
8. The smallest set which contains 43 is **R F Q Z W N**
9. The formula for the area of a triangle with base b and height h is  **$A = \frac{1}{2}bh$**

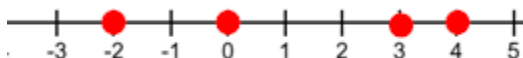
10. The distance d between two points  $(x_1, y_1)$  and  $(x_2, y_2)$  is given by the formula:

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

11. Sketch the graph of  $\{x | 1 < x \leq 6\}$ 12. Write  $\{x | 1 < x \leq 6\}$  in interval notation. **(1, 6]**13. The multiplicative inverse of a complex number is its **conjugate** divided by its **norm**.14. A linear equation in one variable is an equation that can be written in the form  **$ax + b = 0$**  where a and b are real numbers with a not zero.

15. Two equations are **equivalent** if they have the same solution set.
16. A number that makes an equation **true** when substituted for the variable is called a solution of the equation.
17. Calculate the product  $(2 - 3i)(1 + 5i) = 2 + 10i - 3i - 15i^2 = 2 + 7i + 15 = 17 + 7i$

18. The solution set for an equation in one variable is  $\{-2, 0, 3, 4\}$ . Sketch the graph of that equation.



19. Write the compact compound inequality which is equivalent to  $|2x + 7| < 5$ .

$$-5 < 2x + 7 < 5$$

20. Complete the statement of the Transitive Property.

If  $a$ ,  $b$ , and  $c$  are real numbers such that  $a = b$  and  $b = c$ , then  **$a = c$**

21. 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.  **$a > b$**

22. If the solution set of  $|ax + b| < c$  is the interval  $(h, k)$  then

**$\{h, k\}$**  is the set solution of the equation  $|ax + b| = c$  and

**$(-\infty, h) \cup (k, \infty)$**  is the solution set of the inequality  $|ax + b| > c$ .

23. Consider the complex number  $2 - 7i$ .

a. What is its complex component?  $-7$

b. What is its conjugate?  $2 + 7i$

c. What is its opposite?  $-2 + 7i$

d. What is its norm?  $2^2 + (-7)^2 = 53$

e. What is its multiplicative inverse?  $\frac{2 + 7i}{53}$

24. Solve  $S = P + Prt$  for  $P$

$$S = P + Prt$$

$$S = P(1 + rt)$$

$$P = \frac{S}{1 + rt}$$

25. Use the quadratic formula to solve  $x^2 + 5x + 3 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-5 \pm \sqrt{5^2 - 4(1)(3)}}{2(1)} = \frac{-5 \pm \sqrt{13}}{2}$$

26. Solve the inequality  $|3x - 5| > 4$

Begin by solving  $|3x - 5| < 4$  which is equivalent to

$$-4 < 3x - 5 < 4$$

$$1 < 3x < 9$$

$$\frac{1}{3} < x < 3$$

The solution set for  $|3x - 5| < 4$

$$\text{is } \left(\frac{1}{3}, 3\right)$$

Therefore the solution set for  $|3x - 5| > 4$  is  $\left(-\infty, \frac{1}{3}\right) \cup (3, \infty)$

27. Solve the equation  $\sqrt{3x-1} = x+2$

$$\sqrt{3x-1} = x+2$$

$$3x-1 = x^2+4x+4$$

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

Use the Quadratic Formula  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$x = \frac{-1 \pm \sqrt{1^2 - 4(1)(5)}}{2(1)} = \frac{-1 \pm \sqrt{1-20}}{2} = \frac{-1 \pm \sqrt{-19}}{2} = \frac{-1 \pm \sqrt{19}i}{2}$$

The quadratic equation obtained by squaring both sides of the original equation need not be equivalent to the original equation. Therefore both of these possible solution must be tested. I asked you to not perform those tests because of the complexity.

28. Solve the equation  $x^2 = 5x - 6$

$$x^2 = 5x - 6$$

$$x^2 - 5x + 6 = 0$$

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

**By The Zero Factor Property**

$$x-2 = 0 \text{ OR } x-3 = 0$$

$$x = 2 \text{ OR } x = 3$$

**The solution set is {2, 3}**

29. Solve the equation  $\frac{x}{x-3} = \frac{3}{x-3} + 9$

$\frac{x}{x-3} = \frac{3}{x-3} + 9$ <p>Multiply both sides by <math>x-3</math></p> $x = 3 + 9(x-3)$ $x = 3 + 9x - 27$ $0 = 8x - 24$ $8x = 24$ $x = 3$ <p>Because 3 causes a 0 in a denominator of the original equation, 3 is not a solution. Because 3 is the only possible solution, the solution set is the empty set <math>\emptyset</math></p>	$\frac{x}{x-3} = \frac{3}{x-3} + 9$ $\frac{x}{x-3} - \frac{3}{x-3} = 9$ $\frac{x-3}{x-3} = 9$ $1 = 9 \text{ except when } x = 3$ <p>This contradiction establishes that there is no solution. The solution set is the empty set <math>\emptyset</math></p>
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