

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 **$A = \frac{1}{2}bh$**

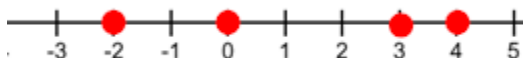
10. The distance d between two points (x_1, y_1) and (x_2, y_2) is given by the formula:

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

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 $x-3$</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 \emptyset</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 \emptyset</p>
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