**Comprehensive Review Homework (Sessions 1-12)**

**Part 1: Algebra & Functions Review**

1. Simplify the expression: (3x^2−4x+1)−2(x^2−x+3).
2. Solve the absolute value inequality and graph the solution on a number line: ∣2x−5∣≥7.
3. Solve the quadratic equation using the quadratic formula: 3x^2+5x−1=0.
4. Find the domain of the function f(x)=sqrt(x-3)/(x-5). Express your answer in interval notation.

**Part 2: Unit Circle & Exact Values**

6. Find the exact value of all six trigonometric functions for the angle θ=−150∘.

7. Find the exact value of all six trigonometric functions for the angle θ=5π/4​.

8. If tan(θ)=−4/3 and sin(θ)>0, find the exact value of sec(θ).

9. If csc(θ)=−3 and cos(θ)>0, find the exact value of cot(θ).

10. Find the exact value of sec(611π​).

**Part 3: Trigonometric Identities & Composition**

11. Verify the identity: sin^2(x)/(1-cos(x))=1+cos(x).

12. Simplify the expression: tan(x)csc(x)−sec(x)​.

13. Find the exact value of the expression: sin(arccos(−4/5)).

14. Find the exact value of the expression: tan(sin^−1(−12/13)).

15. Write an algebraic expression for cos(arctan(3x)).

**Part 4: Graphing Sine & Cosine**

16. Identify the amplitude, period, phase shift, and vertical shift for the function y=−2sin(πx+π)−3. Then sketch one full cycle.

17. Identify the amplitude, period, phase shift, and vertical shift for the function y=3cos(21​x−4π​)+1. Then sketch one full cycle.

18. Write a sine function for a graph with an amplitude of 4, a period of π, a reflection over the x-axis, and a vertical shift 2 units down.

19. Write a cosine function for a graph that has a maximum value of 5, a minimum value of -1, a period of 6π, and a phase shift of π to the right.

20. A trigonometric graph has a high point at (2π​,3) and a subsequent low point at (3π/2​,−5). Write a possible cosine equation for this function.

**Part 5: Solving Trigonometric Equations** *Find all solutions in the interval* [0,2π)*.*

21. tan^2(x)−1=0.

22. 2sin(3x)+3​=0.

23. 2cos^2(x)−7cos(x)+3=0.

24. 2cos^2(x)+sin(x)=1. (Hint: Use a Pythagorean identity first).

25. cos(2x)−cos(x)=0. (Hint: Use a double-angle identity; search up the double-angle identities for reference).

**Part 6: Applications & PSAT-Style Questions**

26. A triangular plot of land has sides measuring 80 feet, 100 feet, and 110 feet. Find the measure of the smallest angle to the nearest tenth of a degree.

27. From the top of a lighthouse 150 feet high, the angle of depression to a boat on the water is 25∘. How far is the boat from the base of the lighthouse, to the nearest foot?

28. Two fire towers, A and B, are 20 miles apart, and tower B is due east of tower A. A fire is spotted from both towers. The bearing from A to the fire is N 35° E, and the bearing from B to the fire is N 45° W. Find the distance from tower A to the fire.

29. If 3x−y=12, what is the value of 2y8x​?

(A) 212

(B) 44

(C) 82

(D) The value cannot be determined from the information given.

30. In the xy-plane, the graph of the function f(x)=x^2−4x+k has no x-intercepts. Which of the following must be true about k?

(A) k<4

(B) k>4

(C) k=4

(D) k≤4