Homework Assignments for *Analysis Approach* Course

Lesson 1: ***Fundamentals of Analytical Thinking in Mathematics***

Homework:

1. **Problem Breakdown:** Choose two complex math problems from your textbook. Break each down into smaller steps, identifying the type of analysis required for each step.
2. **Real-World Connection:** Find a real-world problem that could be approached using mathematical analysis and describe how you would apply analytical thinking to solve it.

Lesson 2: ***Problem-Solving Frameworks in Mathematics***

Homework:

1. **Framework Comparison:** Solve one problem using two different frameworks (e.g., Polya's method and a heuristic approach). Write a comparison of each framework's effectiveness for the problem.
2. **Create Your Own Problem:** Write a challenging math problem that could be solved using trial-and-error, and solve it yourself. Describe how the trial-and-error approach helped.

Lesson 3: ***Graphical Analysis and Interpretation***

Homework:

1. **Graph Analysis:** Find a graph from a news article or online source. Write a paragraph analyzing the trends, outliers, or patterns you observe.
2. **Create Your Own Graph:** Use a small dataset from daily life (e.g., hours studied per day or daily steps) and create a graph. Describe the key features of your graph in a few sentences.

Lesson 4: ***Algebraic Manipulation and Simplification Techniques***

Homework:

1. **Simplification Practice:** Simplify the following expressions:
   - (3x2−6x)/3x(3x^2 - 6x) / 3x(3x2−6x)/3x
   - (x2+2x+1)−(x2−3x+4)(x^2 + 2x + 1) - (x^2 - 3x + 4)(x2+2x+1)−(x2−3x+4)
   - (2y+3)(y−4)(2y + 3)(y - 4)(2y+3)(y−4)

2. **Pattern Recognition:** Identify patterns within these identities and use them to simplify:
    - a2−b2a^2 - b^2a2−b2
    - (x+y)2(x + y)^2(x+y)2
    - x3−y3x^3 - y^3x3−y3

Lesson 5: ***Logical Reasoning and Proofs in Mathematics***

Homework:

1. **Proof Practice:** Write a direct proof for the following statement:
    - If nnn is an even number, then n2n^2n2 is also even.
2. **Contradiction Exercise:** Use proof by contradiction for the statement:
    - There is no smallest positive rational number.

Lesson 6: ***Analyzing Functions and Their Behaviors***

Homework:

1. **Limit Practice:** Find the limits of these functions as xxx approaches the specified values:
    - f(x)=1x−2f(x) = \frac{1}{x-2}f(x)=x−21, as x→2x \to 2x→2
    - g(x)=x2−5x+6g(x) = x^2 - 5x + 6g(x)=x2−5x+6, as x→3x \to 3x→3
2. **Continuity Exercise:** Identify points of continuity and discontinuity for h(x)=x2−9x−3h(x) = \frac{x^2 - 9}{x - 3}h(x)=x−3x2−9.

Lesson 7: ***Probability and Statistical Analysis***

Homework:

1. **Data Analysis:** Use the following dataset to calculate the mean, median, and standard deviation:
    - Data: 5, 12, 7, 9, 10, 6, 8, 10, 7, 9
2. **Probability Exercise:** A bag contains 3 red balls, 4 blue balls, and 5 green balls. Calculate the probability of drawing:
    - a red ball
    - a green ball
    - a blue or green ball

Lesson 8: ***Vectors and Analytical Geometry***

Homework:

1. **Vector Calculations:** Given vectors **A** = (3, 4) and **B** = (-2, 1):
    - Calculate **A + B**.
    - Find the dot product of **A** and **B**.
2. **Application Problem:** Explain a real-world application where vectors would be useful (e.g., navigation, engineering) and describe how vectors aid in problem-solving for that context.