College Algebra / Module 13 - Functions Exam Review

Topic 1: Domain of a rational function: Excluded values
Problem 1: Find the domain of the rational function f(x) = 2/(x^2 - 9). Identify the values that make the denominator zero and express the domain in interval notation.
Problem 2: Determine the domain of g(x) = (x + 1)/(x^2 - 4x + 3). Factor the denominator, find excluded values, and state the domain in interval notation.

Topic 2: Domain and range from the graph of a continuous function
Problem 1: The graph of a continuous function f(x) extends from x = -4 to x = 3 and from y = -2 to y = 5. State the domain and range in interval notation.
Problem 2: For a continuous function g(x) with a graph from x = -2 to x = 6 and y-values from -3 to 4, find the domain and range in interval notation.

Topic 3: Translating the graph of a function: Two steps
Problem 1: The graph of f(x) = x^2 is translated 2 units right and 3 units down. Write the equation of the transformed function and sketch its graph.
Problem 2: Sketch the graph of f(x) = √x shifted 1 unit left and 2 units up. Provide the equation of the transformed function.

Topic 4: Transforming the graph of a function by reflecting over an axis
Problem 1: Reflect the graph of f(x) = x^3 over the x-axis. Write the equation of the new function and sketch its graph.
Problem 2: Reflect the graph of f(x) = |x| over the y-axis. Provide the equation of the transformed function and sketch its graph.

Topic 5: Finding where a function is increasing, decreasing, or constant given the graph: Interval notation
Problem 1: The graph of f(x) increases from x = -3 to x = 1 and decreases from x = 1 to x = 4. Express the increasing and decreasing intervals in interval notation.
Problem 2: For a graph of g(x) that is constant from x = -1 to x = 2 and increases from x = 2 to x = 5, write the constant and increasing intervals in interval notation.

Topic 6: Finding local maxima and minima of a function given the graph
Problem 1: Given the graph of f(x) with a peak at (1, 6) and a low point at (-2, 0), identify the local maximum and minimum points.
Problem 2: For the graph of g(x) with a local maximum at (0, 5) and a local minimum at (3, -1), state the coordinates of the local extrema.

Topic 7: Sum, difference, and product of two functions
Problem 1: Given f(x) = 3x - 2 and g(x) = x + 4, find (f + g)(x), (f - g)(x), and (f * g)(x). Simplify each result.
Problem 2: For f(x) = x^2 + 1 and g(x) = 2x - 3, compute (f + g)(x), (f - g)(x), and (f * g)(x). Provide the simplified expressions.

Topic 8: Composition of two functions: Basic
Problem 1: Given f(x) = 2x + 5 and g(x) = x - 1, find (f ∘ g)(3). Compute the composition and evaluate at x = 3.
Problem 2: For f(x) = x^2 - 2 and g(x) = 3x, find (g ∘ f)(1). Show the substitution and simplify the result.

Topic 9: Domain and range of a linear function that models a real-world situation
Problem 1: A car rental costs $30 plus $0.20 per mile driven. Write a linear function C(m) for the cost of driving m miles, and find the domain and range if miles are between 0 and 100.
Problem 2: A worker earns $15 per hour for h hours, with 0 ≤ h ≤ 40. Define the linear function E(h) for earnings, and determine the domain and range in this context.

Topic 10: Finding domain and range from a linear graph in context
Problem 1: A linear function models the cost C(x) = 5x + 10 for x tickets, where 1 ≤ x ≤ 20. Find the domain and range in the context of this situation.
Problem 2: For a linear function modeling speed S(t) = 2t, where t is time in minutes from 0 to 10, determine the domain and range in context.

Topic 11: How the leading coefficient affects the shape of a parabola

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Problem 1: Compare the graphs of y = 2x^2, y = (1/2)x^2, and y = x^2. Describe how the leading coefficient affects the width of the parabola.

Problem 2: Explain the effect of the leading coefficient in y = -3x^2 compared to y = x^2. Sketch both parabolas to show the differences in shape.