Instructions: This quiz is closed book. You may not use notes, computing devices (calculators, computers, cell phones, etc.) or any other external resource. However, you may ask the instructor for clarification on problems. Please present your work neatly and clearly, **justify** your answers completely, and **box your answers**, when appropriate.

Problem 1. In the following exercise, use direct substitution to evaluate the limit.

- $\displaystyle \lim_{x \to e} \frac{\ln(x^2) + 1}{2^x}$

Problem 2. In the following exercise, we can use direct substitution to show that the limit leads to the indeterminate form $\frac{0}{0}$. Evaluate the limit.

- $\displaystyle \lim_{x \to 3} \frac{x^2 - 3x}{x^2 - 4x + 3}$

Problem 3. In the following exercises, we can use direct substitution to obtain an undefined expression of the form $\frac{K}{0}$. Simplify the function to determine the limit. [Hint: factor the denominator.]

a. $\displaystyle \lim_{x \to 1^-} \frac{x^2 + 2x}{x^2 + 3x - 4}$

b. $\displaystyle \lim_{x \to 1^+} \frac{x^2 + 2x}{x^2 + 3x - 4}$

Problem 4. Evaluate the limit using the squeeze theorem.

- $\lim\limits_{x \to 0} (x^2 \sin(\frac{1}{x^2}))$
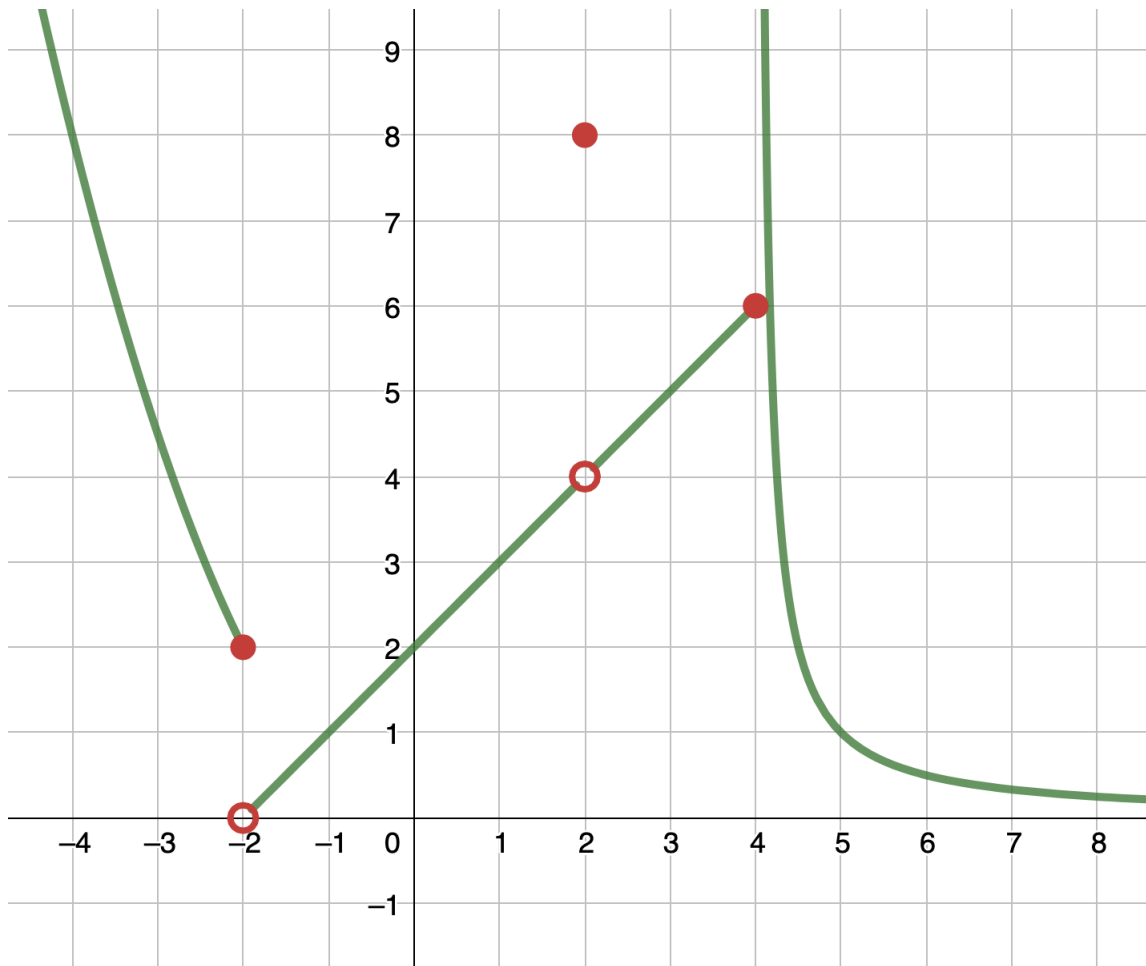
Problem 5.

a. State the three conditions for a function $f(x)$ to be continuous at a point a.

    1. _____ is defined.

    2. _____ exists.

    3. _____ .

b. Consider the graph of the function $y = f(x)$ shown in the graph.

1. Find all values for which the function is discontinuous.

2. Classify each discontinuity as either jump, removable, or infinite.