Last Name: ___________________________ First Name: ___________________________

Directions:
- The use of a calculator, cell phone, laptop or computer is prohibited.
- TURN OFF cell phones and put them away. If a cell phone is seen during the exam, your exam will be collected and you will receive a zero.
- Answer all of the questions, and present your solutions in the space provided. Show all your work neatly and concisely and clearly indicate your final answer. You will be graded not merely on the final answer, but on the quality and correctness of the work leading up to it.

The UC Davis Code of Academic Conduct

I will conduct myself with honesty, fairness, and integrity.

Signature: __________________________________________

(1) For each of the following, draw the graph of a function $f(x)$ with the specified properties. You do not need to give a formula for the function, just draw a graph.

(a) $f(3) = 4$, but $\lim_{x \to 3} f(x) = 2$.

(b) $\lim_{x \to 1^-} f(x) = 3$, $\lim_{x \to 1^+} f(x) = -2$, and $f(1)$ is undefined.
(2) Evaluate each of the following limits.

(a) \( \lim_{x \to -1} \frac{x^2 + 2x + 1}{x^3 - x^2 - 2x} \)

(b) \( \lim_{x \to 0} \frac{\sqrt{x + 9} - 3}{x} \)

(c) \( \lim_{x \to \infty} \frac{12x^3 + 21x^2}{4x^3 + 17} \)
(d) \( \lim_{x \to 2} \frac{|x - 2|(x + 3)}{x - 2} \)

(e) \( \lim_{x \to 4} \sqrt{x + 5} + 7 \)
(3) This problem concerns the following function.

\[ f(x) = \frac{1}{x - 2} + 7. \]

(a) Find the inverse of \( f(x) \).

(b) Verify that \( f^{-1}(f(x)) = x \).
(4) Consider the triangle formed by the following 3 lines.

(i) The line with slope 2 and \( y \)-intercept 3.
(ii) The line with slope \( \frac{2}{3} \) containing the point (2, 3).
(iii) The line containing the points (1, 5) and (3, 1).

Find the vertices of the triangle.
(5) Find the possible values of $a$ and $b$ so that $f(x)$ is continuous for all $x$.

$$f(x) = \begin{cases} 
  x^2 + ax + 1 & \text{if } x < 1 \\
  3 & \text{if } x = 1 \\
  b - x & \text{if } x > 1 
\end{cases}$$