Math 121 - Calculus I Name:
Exam 1: Practice Exam Section:

Please be sure to neatly **show and explain all of your work** and clearly label your answers. Except for your index card, this exam is a closed-book, closed-notebook exam. Calculators are not allowed.

Please write and sign the Honor Pledge here when you are done:

Signed:

Problem	Points .
1	/12
2	/10
3	/10
4	/8
5	/12
6	/8
Total	/60

1. Please compute the following. For each, show all work and clearly explain your reasoning.

   (a) $\lim_{x \to 1} \dfrac{x^2 - 3x + 2}{x^2 - 4x + 3}$

   (b) $\lim_{x \to 2^-} \dfrac{x(x-3)}{x-2}$

   (c) $\lim_{x \to -\infty} \dfrac{4x - x^2}{x - 2}$

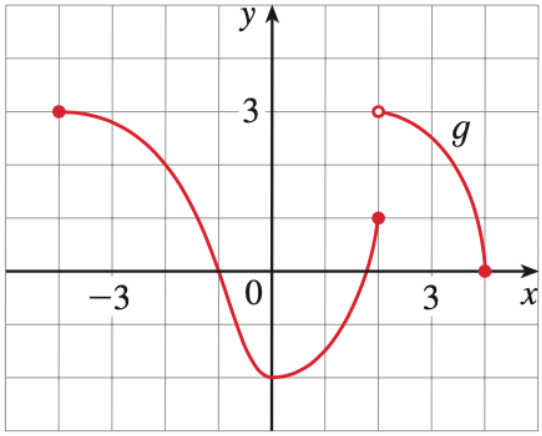
2. Consider the function

$$f(x) = e^{2\sqrt{x-3}}.$$

(a) What is the domain of $f(x)$? Please explain.

(b) Find a formula for $f^{-1}(x)$, the inverse of $f(x)$. Show all work.

3. Suppose that the following is a graph of $g(x)$.



(a) What is the value of $(g \circ g \circ g)(4)$? Show your work.

(b) Please sketch a graph of $g(-x) + 2$.

4. (a) Define what it means for a function to be continuous at $x = a$. (What three conditions must hold for the function to be continuous at a?)

(b) Consider the function given by

$$f(x) = \begin{cases} x & \text{if } x \geq 2 \\ bx^2 & \text{if } x < 2. \end{cases}$$

For what value of b is this function continuous for all x? Clearly explain your reasoning. (It may help to draw a picture here. It's not required, but it might help you sort out your thinking.)

5. Suppose that for $t > 0$, the position of a particle at time t is given by

$$s(t) = \frac{1}{t}.$$

(a) Sketch the graph of $s(t)$.

(b) Find the average velocity of the particle between time $t = 1$ and $t = 1 + h$.

(c) Express the instantaneous velocity of the particle at time $t = 1$ as a limit of average velocities. (Note: *you do not need to compute the limit.*)

(d) What feature of the graph from part (a) does your answer to part (c) measure?

6. Please give an example of a function satisfying each of the following conditions. For each, please give the algebraic expression of your function as well as a graph of your function.

   (Hint: your examples do not need to be complicated! Keep in mind our basic functions as you consider this question.)

   (a) A vertical asymptote at $x = 5$.

   (b) A horizontal asymptote at $y = 2$.

   (c) A removable discontinuity at $x = 2$.