Practice Midterm I
MAT 125, Spring 2008
Time: 1 hour 30 mins

Name:	ID #:	Section:

Please answer each question in the space provided. Show your work whenever possible. Unless otherwise marked, **answers without justification will get little or no partial credit**. Cross out anything the grader should ignore and circle or box the final answer.

No calculators!

(1) If $f(x) = \ln x$ and $g(x) = x^2 - 4$, find the functions $f \circ f$, $f \circ g$, $g \circ f$, $g \circ g$, and their domains.

(2) Calculate the following limits
   (a) $\lim_{x \to 2}(3x^2 + x - 2)$
   (b) $\lim_{y \to -3} |y + 3|$
   (c) $\lim_{x \to 2} \frac{x^2 + x - 6}{x - 2}$
   (d) $\lim_{q \to 2} \frac{2q^2 + 5}{\sqrt{q + 2}}$
   (e) $\lim_{t \to 3} \frac{\sqrt{t} - \sqrt{3}}{t - 3}$
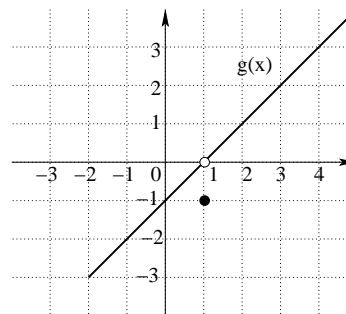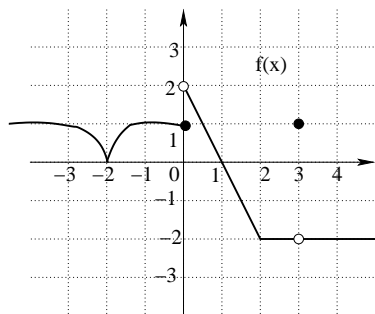   (f) $\lim_{s \to 0} s^2 \cos\left(s + \frac{1}{s}\right)$

(3) Calculate
$$\lim_{x \to 1}\left(\frac{1}{x - 1} + \frac{1}{x^2 - 3x + 2}\right)$$

(4) Let $f(x) = \left|1 + \frac{1}{x}\right|$.
   (a) Sketch the graph of f.
   (b) Find all values of x for which f is not continuous.

(5) Use the graphs of $f(x)$ and $g(x)$ below to compute each of the following quantities. If the quantity is not defined, say so.

$f(0)$ $\qquad$ $\displaystyle\lim_{x\to 0+} f(x)$ $\qquad$ $\displaystyle\lim_{x\to 0-} f(x)$ $\qquad$ $\displaystyle\lim_{x\to 0} f(x)$

$\displaystyle\lim_{x\to 1} g(x)$ $\qquad$ $\displaystyle\lim_{x\to 1} f(x) - g(x)$ $\qquad$ $\displaystyle\lim_{x\to 3}(2f(x) - f(3))$

(6) Consider the function

$$f(t) = \begin{cases} \frac{t}{t-1} & t \geq 0 \\ t+1 & t < 0 \end{cases}$$

(a) At which points is this function continuous?
(b) Find the left and right limits, if they exist, at $t = 0$.