Practice Midterm 1
MAT 125, Spring 2006
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) 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) $\lim_{s\to 0} s^2 \cos\left(s + \frac{1}{s}\right)$

(2) Calculate
$$\lim_{x\to(\pi/2)-} \frac{1 + \tan x}{1 - \tan x}$$

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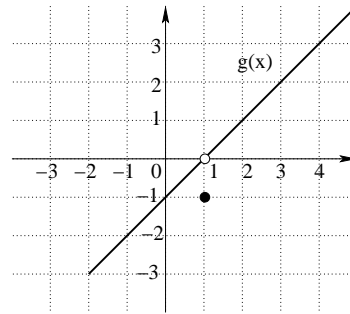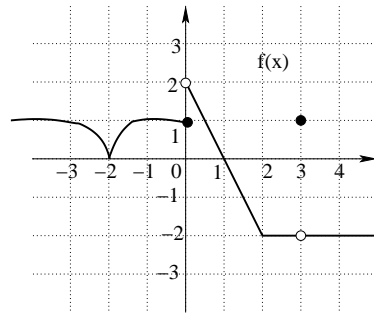 (a) Sketch the graph of f and identify the asymptotes.
  (b) Find all values of x for which f is not continuous.

(4) Find
$$\lim_{x\to 1} e^{(x^2-x-1)}.$$
Between which two integers (whole numbers) does the answer lie?

(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.

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

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

(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 $t = 0$.

(7) Explain, without using a graphing calculator, why the equation $x^5 - 3x + 1 = 0$ must have a solution with $0 < x < 1$.