March 3, 2003   **Name** _____
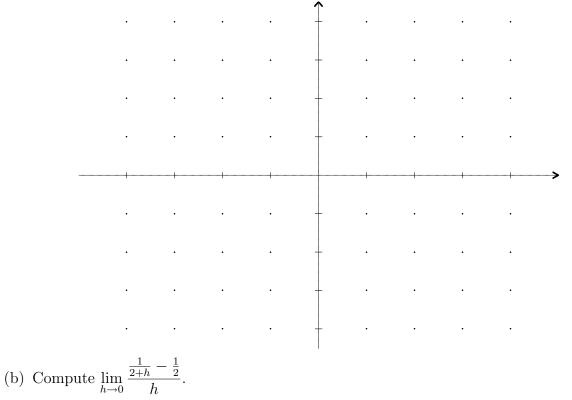
On all the following questions, **show your work.**

1. (20 points) Let $f(x) = \frac{1}{1+x}$. Notice that $f(1) = 1/2$.

   (a) Sketch the graph of f on the grid provided and draw the line tangent to the graph of f at the point $(1, 1/2)$. Estimate the slope of the line.

   (b) Compute $\lim\limits_{h \to 0} \dfrac{\frac{1}{2+h} - \frac{1}{2}}{h}$.

   (c) Describe what the answer to (b) means.

2. (20 points) Let $g(x) = \sqrt{x+2}$. Find $g'(a)$ by taking the limit of the difference quotient. In other words, use the definition of derivative.

3. (20 points) Describe in English what it means to say that "the limit of a function f is 3 as x approaches 2". Sketch the graph of a function which has this property but also satisfies $f(2) = 1$.

4. (20 points) Let $k(x) = x^2 - x$.

   (a) Using the definition of derivative, find $k'(x)$

   (b) Evaluate the function found above at $x = 3$ to find $k'(3)$.

   (c) Use the information above to find an equation for the line tangent to the graph of k at the point $(3, k(3))$.