

### Homework Assignment 16: Due at the beginning of class 11/2/01

In this homework assignment, the function  $f(x)$  will always refer to the function defined by the equation:

$$f(x) = \frac{1-x}{x^2},$$

with domain  $x > 0$ .

1. Complete the following table. What is the value of the derivative of  $f(x)$  at  $x = 3$ ?

x	2.9	2.99	2.999	2.9999	3.0001	3.001	3.01	3.1
$\frac{f(x) - f(3)}{x - 3}$								

2. Find the equation of the tangent line of  $f(x)$  that is based at  $x = 3$ . Sketch a graph showing both  $y = f(x)$  and the tangent line based at  $x = 3$ . Indicate how the result of Question 1 influences the appearance of your graph.
3. Use the definition of the derivative to find an equation for the derivative of  $f(x)$  at  $x = a$ .
4. Use the axes provided on the next page to sketch a graph of  $y = f(x)$  and directly below that, a graph of  $y = f'(x)$ . (You should hand in the page with the axes on it as part of your completed homework assignment.)
5. Explain how the features that appear on your graph of  $y = f'(x)$  correspond to the features that appear on your graph of  $y = f(x)$ . Your answer should address the following features of the graph of  $y = f'(x)$ :
- intervals where  $f'(x) > 0$
  - intervals where  $f'(x) < 0$
  - points where  $f'(x) = 0$
  - points where  $f'(x)$  attains a maximum (top of a hill) or minimum (bottom of a valley) value
  - intervals where  $f'(x)$  increasing
  - intervals where  $f'(x)$  decreasing

