

## Worksheet 2 for MA 113 - Calculus I (Spring 08)

01/22/08

Work the following three problems related to limits and derivatives and hand in your solutions. *As always, write up your solutions neatly, carefully, and in complete sentences.*

For these exercises, it will be useful to recall that we can rewrite the difference of radicals by multiplying and dividing by the conjugate:

$$\sqrt{a} - \sqrt{b} = \frac{(\sqrt{a} - \sqrt{b})(\sqrt{a} + \sqrt{b})}{\sqrt{a} + \sqrt{b}} = \frac{a - b}{\sqrt{a} + \sqrt{b}}.$$

1. Let  $x$  be a positive number. Find the limit

$$\lim_{h \rightarrow 0} \frac{\sqrt{7 + 4(x + h)} - \sqrt{7 + 4x}}{h}.$$

(The result will be a function of  $x$ ).

2. Consider the function  $f(x) = \sqrt{9 - x^2}$  and let  $a$  be a number in the open interval  $(-1, 1)$ .
- (a) Using the definition, find the slope of the tangent line to the graph of  $f$  at the point  $(a, f(a))$ .
  - (b) Determine the slope of the line through the origin and the point  $(a, f(a))$ . Sketch this line, the graph of  $f$ , and the tangent line you computed in (a). Interpret your result in (a) geometrically.

3. Write the definition of the derivative of a function  $f$  at a point  $a$ .

**Due date:** January 30, 2008, at the beginning of the lecture