TA: Ondřej Čertík
web: `http://hpfem.math.unr.edu/~ondrej/`
class: MATH 181
date: February 24, 2009

1 Introduction

We did retakes, then problems from the section 3.2.

2 Problem

Interesting problem is page 192, prob. 54a).

Find equations of both lines through the point $(2, -3)$ that are tangent to the parabola $y = x^2 + x$.

Solution:

The slope of a tangent line at a point $x = x_0$ is:

$$m(x_0) = y'(x_0) = 2x_0 + 1$$

So the equation of the tangent line (passing through the point $(2, -3)$) at the point $x = x_0$ is:

$$m(x_0) = \frac{y - y_1}{x - x_1} = \frac{y - (-3)}{x - 2}$$

$$2x_0 + 1 = \frac{y + 3}{x - 2}$$

or:

$$y = (2x_0 + 1)(x - 2) - 3$$

We still have one unknown in the equation: x_0. To determine it, we use the fact, that at the point $(x_0, y(x_0)$, the y-coordinate coming from both the equation of the line and the parabola must be the same, since they both intersect at that point, e.g.:

$$y(x_0) = y(x_0)$$

$$(2x_0 + 1)(x_0 - 2) - 3 = x_0^2 + x_0$$

Solving this yields two solutions, $x_0 = 5$ and $x_0 = -1$. So the equations of the two tangent lines are:

$$y = (2 \cdot 5 + 1)(x - 2) - 3 = 11x - 25$$

$$y = (2 \cdot (-1) + 1)(x - 2) - 3 = -x - 1$$

3 Quizzes

The Quiz 11 is a hometake, due Thursday.