# ASSIGNMENT 7

Due on: November 25 at 8:00 in the morning (submit before class begins).

Be sure to write your name and student ID on your assignment.

Questions:
  (1) Let $f(x) = e^{\sin x}$. Find the inflection points of $f(x)$ on the interval $[0, 2\pi]$.
  (2) Of all points on the parabola $y = x^2 + x$, which one is the closest to the point $(1, -1)$? (Hint: $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$.)
  (3) The line $y = a$ always intersects the hyperbola $x^2 - y^2 - y = 1$ at two points, A and B. Which value of a makes the line AB as short as possible?
  (4) A rancher wants to use 100 meters of fence to build a barn shaped as circular sector (see the picture). What is the maximal possible area of such a barn?
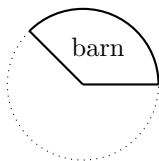
  (5) A van is driving along a road shaped as a semicircle with radius of 20km. The van is currently at the end of the semicircle and the driver wants to reach point A, which is off the road (see the picture). While on the road, the driver can drive at 60km/hr. However, off the road, he can drive at only 20km/hr. The driver can drive some distance along the road, and then get off the road and drive straight to A. How many kilometers should the driver drive on the road in order to get to A as fast as possible?
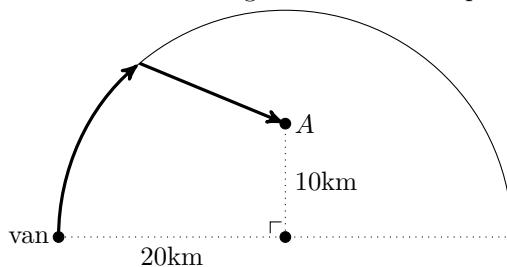
  (6) Solve question (5) when the driver can drive at 30km/hr off the road.