

## HOMEWORK 10

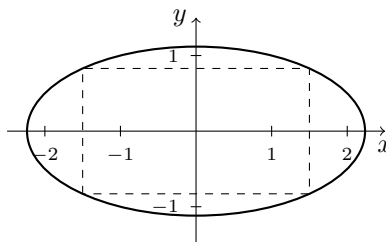
**Due on:** November 25 at 2:00pm (submit via Crowdmark).

**Question 1.** West Airlines offers flights from Vancouver to Toronto on planes that can fit 300 economy class seats. The company can remove some of the economy seats and replace them with business class seats, each taking twice as much space as an economy class seat. West Airlines' analysts estimate that:

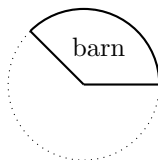
- if there are  $q_e$  economy class seats on a flight, then they will be sold at  $500 - q_e$  dollars each, and
- if there are  $q_b$  business class seats on a flight, then they will be sold at  $1000 - 6q_b$  dollars each.

How many seats of each kind should West Airlines put on their airplanes in order to maximize their revenue?

**Question 2.** What is the largest possible perimeter of a rectangle bounded in the ellipse  $x^2 + 4y^2 = 5$  such that its edges are parallel to the axes (see illustration)?



**Question 3.** A rancher wants to use 200 meters of fence to build a barn shaped as circular sector (see illustration). What is the maximal possible area of such a barn?



**Question 4.**

- Approximate  $1.2^{1.2}$  by using the linear approximation of  $f(x) = x^{1.2}$  at  $x = 1$ .
- Use the second derivative to determine whether the answer to (a) is an overestimation or an underestimation.
- Use the second derivative to show that the error of the approximation (in absolute value) is less than 0.005.