Optimization: Distances

Goal: • Can interpret the zeros of the derivative of some function. • Can create an equation for geometrically connected obects.
Terminology: • Optimization
Reminder: • Test on Feb 4th

We know that local maximum and minimums occur for the function f when f' changes sign (First Derivative Test). Optimization is the application of finding max and minimums in order to maximize material used, or minimize cost to build.

Example: What is the largest rectangle (in terms of area) that can fit between the parabolas?

$$y = 4 - x^2$$
$$y = \frac{1}{2}x^2 - 2$$

Practice: What is the largest rectangle (in terms of perimeter) that can fit between the parabolas?

Example: Fiber optics need to be laid between two communities. Community A is along a river that is 1 km wide, on the opposite side is community B which is 10 km downstream from A and 5 km inland. It costs $300/m to install fibre optics under the river and $200/m to install it on land. How far downstream from A should the cables be built?

Practice Problems: 4.5: # 1, 2, 5, 6, 8-17, 19

18, 20

In Class Evidence

6. A box with an open top is to be constructed from a square piece of cardboard, 3 m wide, by cutting out a square from each of the four corners and bending up the sides. Find the largest volume of such a box.

11. Find the point on the parabola $2y = x^2$ that is closest to the point $(-4, 1)$

13. A piece of wire 40 cm long is cut and bent into a square and a circle. How should the wire be cut to (a) maximize total enclosed area (b) minimize total enclosed area.

18. Find the largest possible volume of a cylinder inside a sphere of radius r.