MAT 155B - FALL 12 - ASSIGNMENT 3

Due date: Friday, Oct 19th[1]

Question 1. Suppose that a plate is immersed vertically in a fluid with density ρ and the width of the plate is $w(x)$ at a depth of x meters beneath the surface of the fluid. If the top of the plate is at depth a and the bottom is at depth b, show that the hydrostatic force on one side of the plate is

$$F = \int_a^b \rho g x w(x)\, dx,$$

where g stands for the acceleration of gravity.

Question 2. In Economics, the *demand function* $p(x)$ is the price that a company has to charge in order to sell x units of a commodity. The graph of $p(x)$ is called a *demand curve*. Denote by x_* the amount of the commodity which is currently available, so that $p_* = p(x_*)$ is the current selling price. Assume that $p(x)$ is a decreasing function.

(a) What is the interpretation of the quantity

$$\int_0^{x_*} \Big(p(x) - p_*\Big) dx \ ?$$

Justify your answer.

(b) Is the assumption that $p(x)$ is decreasing reasonable? Justify your answer.

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[1]You do not need to hand this in during class. Bring it to my office at any time which is convenient for you. If you do not find me there, please slide it under the door.