

Math 120 Extra Credit

Oct. 27, 2010

Instructions: Do as many problems as you can. Credit will only be given for correct solutions so it is in your interest to solve a smaller number of problems correctly than trying all the problems and doing none of them well.

Warning: This stuff is more difficult than your normal questions. Just letting you know. I don't wanna hear any complaints.

Problem 1

An investment club bought a bond of an oil corporation for \$4000. The bond yields 7% per year.

The club now wants to buy shares of stock in a hospital supply company. The stock sells at \$15 per share and earns a dividend of \$0.60 per share per year.

How many shares should the club buy so that its total investment in stocks and bonds yields 6% return on investment per year?

Problem 2

A company manufactures products A and B . The cost of producing each unit of A is \$2 more than that of B . The costs of production of A and B are \$1500 and \$1000, respectively, and 25 more units of A are produced than of B . How many of each are produced?

Problem 3

Find two numbers whose sum is 78 and whose product is a maximum.

Problem 4

You are a plasma physicist who is going trying to determine what ion density x is needed to sustain nuclear fusion. In order for the reactor to be sufficiently powerful, x must be greater than 1.

The Tritium pumped into the reactor follows the function

$$T(x) = \frac{6}{\sqrt{x}},$$

the Tritium burned by the reaction follows the function

$$B(x) = \frac{1}{x}.$$

In order for the fusion to be sustained, the difference between the amount pumped into the reactor and the amount burned up must be equal to 3. Determine what x must equal.

Problem 5

Refer back to problem 4. Your fusion reactor has been improved so that radiative energy is now preserved. The radiative energy is based on the function

$$R(x) = \frac{2}{x^{3/2}}.$$

Now in order for the fusion to be sustained the difference between the amount pumped in and the amount burned up must be equal to 3 minus the radiative energy. Determine what x must be.

Problem 6

Prove that the points $A(0, 0)$, $B(1, 1)$, $C(-1, 1)$, $D(1, 3)$ form a trapezoid, which is a quadrilateral that has one set of parallel sides. Also prove that one of the non-parallel sides is perpendicular to the parallel sides.