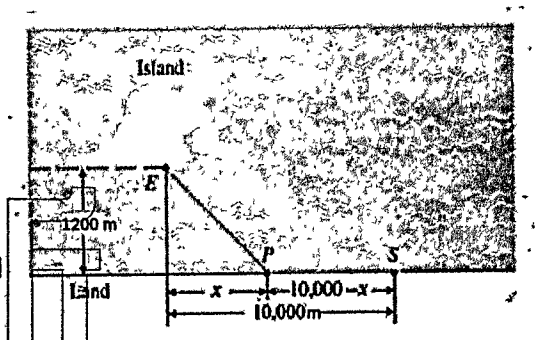
1.(20%) In the diagram, S represents the position of a power relay station located on a straight coast, and E shows the location of a marine biology experimental station on an island. A cable is to be laid connecting the relay station with the experimental station.



If the cost of running the cable on land is $ 5/running meter and the cost of running the cable under water is $ 13/running meter, locate the point P that will result in a minimum cost (solve for x).

2.(20%) Find the indefinite integral of the following functions.

a. $\int \frac{ln6x}{x} dx.$

b. $\int x^2 \, ln5x \, dx$

3.(20%) Find the derivative of the following functions.

a. $r(x) = \frac{2x}{7} - \frac{x^{0.3}}{2} + \frac{4}{7x^{1.3}} - 4$

b. $f(x) = \ln\left|\frac{(5x+3)^6}{(4x+2)^9(8x+9)}\right|$

4.(20%) I want to fence in a rectangular vegetable patch. The fencing for the east and west sides costs $5 per foot, while the fencing for the north and south sides costs only $3 per foot. I have a budget of $150 for the project. What is the largest area I can enclose?

5.(20%) The Ross-Simons Company has a monthly advertising budget of $40,000. Their marketing department estimates that if they spend x dollars on newspaper advertising and y dollars on television advertising, then the monthly sales will be given by $z = f(x,y) = 30x^{3/4}y^{1/4}$ dollars. Determine how much money Ross-Simons should spend on newspaper ads and on television ads each month to maximize its monthly sales.