

Homework #5

Routine problems:

4.10. # 10, 19.

4.11. # 3, 5, 16, 20, 21–31.

4.12. # 3, 8, 14, 15

To hand in:

- (1) A power line is needed to connect a power station on the shore of a (straight) river to an island 4 kilometers down the stream and 1 kilometer offshore.
 - (a) Find the minimum cost of such a line, given that it costs \$50,000/km to lay wires underwater and \$30,000/km to lay wire underground. Also find the point where the line should leave the shore.
 - (b) Same questions with costs underwater and underground reversed.
 - (c) Same questions with costs of \$50,000/km underwater and \$49,000/km underground.
- (2) A problem of considerable importance in astronomy is to determine the “eccentric anomaly” as a function of time. This reduces to solving the following equation for z as a function of w (for each fixed time t):

$$w = \frac{z - t}{\sin z}.$$

Note that if $t = 0$, then w tends to 1 as z tends to 0. Estimate z when $t = 0$ and $w = 1.1$ using at least three steps of Newton’s method.