

Name: \_\_\_\_\_

## Problem Set 4

### Computational Methods (ERS 420)

## Purpose

Improve understanding of integration and use numerical integration to calculate potentially important environmental parameters.

## Problems

1. Write a short general script based on the trapezoid rule to numerically integrate a problem. Prepare this so the integration method can be imported into and used in a different script. Write a 'docstring' within the script that describes the script so a user could figure out what it does and how to apply it.
2. Bathymetry (feet) of Sebago Lake is provided in the attached file based on a 30 m by 30 m grid. Sebago Lake has an elevation of about 266 ft., however the data is based on 20 ft contour intervals and the conversion from contours to a grid has produced artifacts in the data (e.g. lower elevations in the center of islands). The last reasonable bathymetry value is about 232 ft, and you may assume (incorrectly) that this elevation at the edge of the lake is 232 ft.

Using this data file, complete the following tasks:

- Estimate the cross sectional area of Sebago Lake along a east-west transect that passes through the deepest point in the lake using the trapezoid rule.
- What is the volume of water stored in Sebago Lake.
- Make a 2-D map-view contour or image style plot of the Sebago Lake data. Make sure the data is oriented with north-up.

## Expectations

Turn in a typed report, clearly but concisely showing how you completed each problem and your answer to each problem. Include within your report any python scripts used to solve the problems and/or the input and output from python sessions used to solve problems. All material submit by e-mail must be submitted as a **single** pdf document or ipython notebook.