Example: Geometric Growth Model for Water Quality. A scientist is studying how soil runoff after a major rainfall affects the water quality in a local lake. One index of water quality is TDS, Total Dissolved Solids, which measures amounts of chemicals and minerals from such sources as urban runoff, hard water, salinity due to irrigation, and acid rain. The TDS level of a water sample is measured in units of milligrams per liter, or mg/L.

Immediately after a major rainfall, the TDS levels in the lake are elevated due to runoff from the surrounding area. But over time, the effects of the runoff dissipate, and normal TDS levels are restored. The scientist is testing geometric growth models for this process. In one investigation, shortly after a major rainfall, a TDS level of 414 mg/L was detected in the lake. Three days later the TDS level was found to be 381 mg/L. Assuming geometric growth, find an equation for the TDS level t days after the initial measurement, and use it to predict when the TDS level will be 250 mg/L.