Activity 7.3 – Graph Analysis with the TI-84

The table shows OPEC's surplus crude oil production capacity (in million barrels per day) for selected years after 2008. The value for 2014 is projected.

Years after 2008	Surplus (mill. barrels per day)
0	1.37
2	3.99
4	2.13
6	3.88

(Source: U.S. Energy Information Administration)

1. View a scatter plot of the data and write an appropriate model. Store the model in the function menu as Y1. Record the model here by rounding the coefficients to three decimal places. Include units and a domain.

2. Answer each part by using the appropriate choice from the "calculate" menu on your calculator. Use the stored formula, not the one you wrote down above. Round each answer to two decimal places, and include units.

   (a) According to the model, for which values of t did the surplus reach 3 million barrels per day? (**Hint**: Find the intersection points of your model and the line $y = 3$.) To which years do these values correspond?

   (b) What was the surplus at the end of 2009?

   (c) How fast was the surplus changing at the end of 2009? Is this an increase or a decrease?

(d) For which value of t between the years 2008 and 2011 was the surplus at a maximum? What was the surplus at that time?

(e) For which value of t between the years 2011 and 2014 was the surplus at a minimum? What was the surplus at that time?

3. Find the derivative of the unrounded model that is stored in your calculator. Record the model here by rounding the coefficients to three decimal places. Include units and a domain. Graph the derivative in an appropriate window.

   (a) Verify the times found in Parts (d) and (e) of Part 2 using the derivative model and your TI-84. (**Hint**: An extremum may occur where the derivative has a t-intercept.)

   (b) For which value of t was the surplus declining most rapidly? (Think inflection.) To which year does this value correspond? Verify this answer algebraically.

   (c) What was the rate of change of the surplus at the time of most rapid decline?