Math 151 - Section C1 - Summer 2014
Workshop 6

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Worked on Thursday June 19, 2014
Due Wednesday June 25, 2014

Problem 1: Some people really like Wikipedia.[citation needed] Apparently, some of those people also really like calculus, and they tried to understand how the total number of Wikipedia articles is changing over time. Those people came up with the following function to model the total number of articles at different dates:

$$W(t) = ae^{be^{ct}},$$

where $a = 4378449$, $b = -15.42677$, $c = -0.384124$, and t is the number of years since the date January 1, 2000 (so $t = 10.00$ corresponds to January 1, 2010).[1]

(a) What is $\lim_{t\to\infty} W(t)$? What would this mean about the long-term total number of Wikipedia articles?

(b) What is $W'(t)$? (You can leave your answer in terms of the parameters a, b, and c instead of writing down those big messy numbers.) What does $W'(t)$ represent in this context?

(c) According to the function $W(t)$, when was Wikipedia growing the *fastest*?

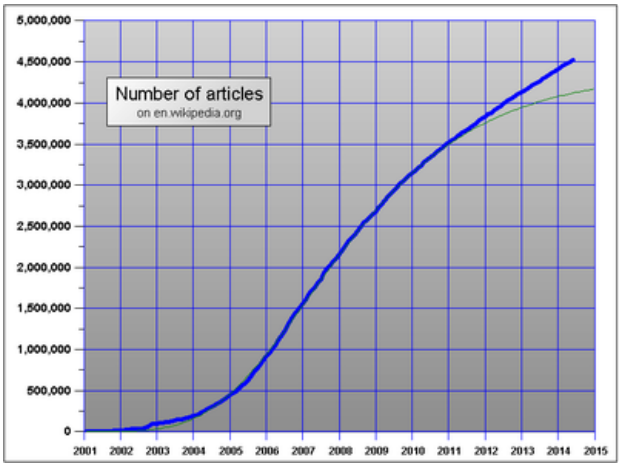

Figure 1: The actual data for the total number of Wikipedia articles at various dates is in dark. There is also a thin line showing the number predicted by $W(t)$, but it agrees so well with the data that it's hard to see.

[1] The source for all this information is (of course) Wikipedia `http://en.wikipedia.org/wiki/Wikipedia:Size_of_Wikipedia`

Problem 2: For any constant c, define the function f_c with the formula $f_c(x) = x^3 + 2x^2 + cx$.

(a) Graph $y = f_c(x)$ for these values of the parameter c: $c = -1, 0, 1, 2, 3, 4$. What are the similarities and differences among the graphs, and how do the graphs change as the parameter increases?

(b) For what values of the parameter c will f_c have one local maximum and one local minimum? Use calculus. As c increases, what happens to the distance between the local maximum and the local minimum?

(c) For what values of the parameter c will f_c have no local maximum or local minimum? Use calculus.

(d) Are there any values of the parameter c for which f_c will have exactly one horizontal tangent line?

Problem 3: Let (x, y) be on the curve $y = \sqrt{x}$, and let L be the distance between (x, y) and $(4, 0)$ [as shown]. Find the x value that minimizes this distance. [Hint: first write L only in terms of x.]