ASSIGNMENT 7

There are two parts to this assignment. The first part is on WeBWorK — the link is available on the course webpage. The second part consists of the questions on this page. You are expected to provide full solutions with complete justifications. You will be graded on the mathematical, logical and grammatical coherence and elegance of your solutions. Your solutions must be typed, with your name and student number at the top of the first page. If your solutions are on multiple pages, the pages must be stapled together.

*Your written assignment must be handed in **before your recitation on Friday, November 6**. The online assignment will close at **9:00 a.m. on Friday, November 6**.*

1. Find the equation of the line tangent to $y = (1 - 2x)^{10}$ at $(0, 1)$.

2. The curve described by the equation
$$\left(x^2 + y^2\right)^2 = x^2 - y^2$$
   is an example of a *lemniscate*.

   (a) Determine the points with nonzero x-values at which the lemniscate has horizontal tangent lines.
   (b) Can you conclude that the lemniscate has horizontal tangent lines at the origin? Can you conclude that it does *not* have horizontal tangent lines? Justify your answers in one or two paragraphs.

3. A small coffee cup from Great Dane Coffee, a campus coffee shop, is in the shape of a truncated right circular cone with large diameter $7.5\,\text{cm}$, small diameter $5.5\,\text{cm}$, and side length $9\,\text{cm}$, as pictured below.
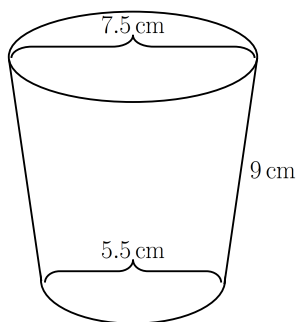
   Suppose coffee is poured in at a rate of $15\,\text{cm}^3/\text{sec}$. What is the rate at which the depth of coffee is increasing when the cup is half full?

   On your UBC Blog, post a related rates question, of similar or lower difficulty, which involves something that may be found on the UBC campus. Then post a solution to your question.

   You will be graded on the appropriateness of your question and the correctness of your solution. Bonus marks will be given for particularly creative questions.

   On your assignment submission, please include the URL of your blog.