MATH2004DE-Assignment 1

- This Assignment MAY NOT be distributed in any way without written permission of your professor.
- You may either write your answers on this, or on your own paper or on your electronic devices (do not need to copy questions).
- Show all of your work in getting your solution. A correct final answer with no justification risks getting zero points! **Keep exact answer.**
- Due date: **Friday, Jan 29 at 10pm. Total points: 30 points.**
  - No e-mail submission will be accepted.
  - Technical issues are not an excuse. Don't wait until the deadline to submit.
- Submission Requirements:
  - Only a single PDF file is allowed. Other file types will NOT be accepted. Combine all pages into **single** .pdf file (using any app or software you like, such as CamScanner). Submit this .pdf file on CuLearn.
  - If you have some changes after submission, you can resubmit before deadline.
  - Once you submit your assignment, **you certified that this is your own work.** The penalty for plagiarism is going to be very substantial.
  - Page size: A4 or Letter.
  - Orientation: The PDF document should be in proper orientation so as not to require rotation.
  - Resolution: The PDF document must be of sufficient resolution and writing must be legible. Pictures of your work are NOT an acceptable substitute for a scan.
  - File name format: LastName-StudentNumber-Ass1.pdf
  - Failure to follow these instructions will result in a grade of zero.

Surname _____ **First Name** _____ **Student #** _____

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1. (4 points) Given the two lines:

$$L_1: \quad \vec{r}(t) = (1,1,2) + t(1,1,-2),\ t \in \mathbb{R};$$

$$L_2: \quad \vec{r}(t) = (1,7,-2) + s(1,-5,2),\ s \in \mathbb{R}.$$

(a) Classify the relation of the two lines, i.e., parallel, or intersected (if so, find the intersection), or skewed.

(b) Find the equation of the plane containing the two lines.

2. (2 points) Given the two planes:

$$\Pi_1 : 2x - y + 3z = 5; \quad \Pi_2 : x + 2y + kz = 3.$$

Find the value of k such that the angle between the two planes is $\frac{\pi}{4}$.

3. (2 points) Given that the image of the point (x, y) under the change of the origin **O=(1,5)**, then followed by a counterclockwise rotation of the new axes with the angle $\theta = \frac{\pi}{2}$ is (2, -1). Find the point (x, y).

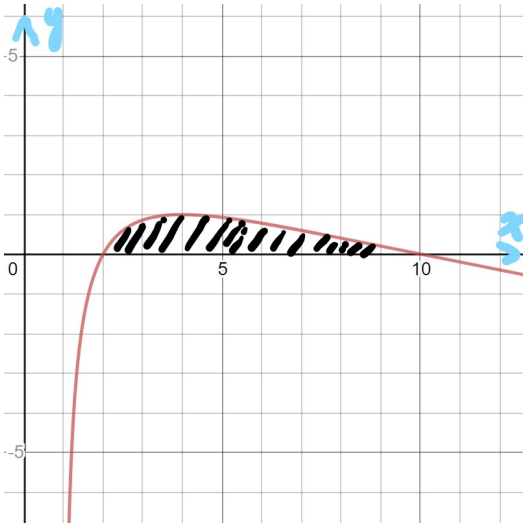
4. (4 points) The parametric curve C is given by

$$x = t^2 + \ln(2e^{t-1} - t), y = t^6 - \cos(t^2\pi).$$

Find the tangent line to the curve at the point $t = 1$.

5. (4 points) Find the length of the curve C: $x = e^{3t}\cos(4t)$, $y = e^{3t}\sin(4t)$, $0 \leq t \leq 1$.

6. (5 points) The region D is enclosed by the curve $x = 1 + e^{t \ln 3}$, $y = 2t - t^2$ and the x-axis. Find the area of the region D.



7. (5 points) Find the tangent line of the polar curve $r = 2 + \sin\theta$ at $\theta = 0$.

8. (4 points) Find the area of the region outside $r = 3 + 4\sin\theta$ and inside $r = 5 + 2\sin\theta$, from $\theta = 0$ to $\theta = \dfrac{\pi}{2}$.