MATH 1700 D01 Fall 2017 Assignment 1

SHOW ALL WORK to get full marks. Leave answers as exact answers. For example, leave it as fractions such as 1/7 as opposed to decimals such as 0.142857. Word problems should have sentence answers with units. Fractions should be lowest terms.

Calculators are not permitted. Assignments using a calculator will not be graded.

All assignments must be handed in on UMLearn as **one PDF file**. Late assignments will not be accepted. Failure to follow the instructions will result in a mark of 0.

Techniques from this course must be used to solve the questions, not more advanced techniques.

The assignment covers sections 4.4,1.5,3.5,10.1–10.3, 5.1–5.2 in the textbook.

Assignments are to be done independently.

1. Evaluate the following limits using L'Hopital's Rule. Make sure to justify that you can use L'Hopital's Rule every time.

   [3] (a) $\displaystyle\lim_{x\to 1} \frac{\tan(x-1)}{x^4-1}$

   [3] (b) $\displaystyle\lim_{x\to 0} \frac{\cos(x^2)-1}{x^4}$

   [4] (c) $\displaystyle\lim_{x\to -\infty} (x\sec(2/x) - x)$

   [5] (d) $\displaystyle\lim_{x\to 0^+} (\tan x)^{\sqrt{x}}$

   [5] (e) $\displaystyle\lim_{x\to 0} (e^x + 2x)^{3/x}$

[6] 2. Simplify the expression $\csc(\tan^{-1} x)$. Make sure you are showing full work and explain your answer.

3. For the parametric curve $x = t^2 + t, y = t^3 + t^2$

   [2] (a) Compute dy/dx in terms of t.

   [5] (b) Determine the equation of the tangent line to the curve at the point $(2, -4)$.

   [4] (c) Find the point(s) on the curve where the tangent line to the curve at that point is horizontal.

   [5] (d) Find the point(s) on the curve where the tangent line to the curve at that point is vertical.

4. For the curve $x = t^2 + t, y = t^3 + t^2$

   [7] (a) Show the curve crosses itself at the point $(0, 0)$. (Hint: Find two different values of t which give the same point and show that the tangent lines at those values are different)

   [4] (b) Sketch the curve using information from question 3 and 4a.

[6] 5. Find $\frac{dy}{dx}$ for the polar curve $r = 3+3\sin\theta$ and use it to find the points where the tangent line is vertical,horizontal or neither when $\theta = \frac{3\pi}{2}$.

6. Sketch the polar curves

[3] (a) $r = 3 + 3\sin\theta$

[3] (b) $r = 2\cos 4\theta$.

[10] 7. Use the Riemann sum compute the area under the curve of $y = x^3 + 3x - 3$ from $x = 1$ to $x = 4$. (Note: $f(x)$ is positive on $[1, 4]$)

This assignment is out of 75 points.