Calculus I

- This homework should be submitted via Gradescope by 23:59 on the date listed above. You can find instructions on how to submit to Gradescope on our Campuswire channel.

- There are three main ways you might want to write up your work.

    - Write on this pdf using a tablet
    - Print this worksheet and write in the space provided
    - Write your answers on paper, clearly numbering each question and part.
        * If using either of the last two options, you can use an app such as OfficeLens to take pictures of your work with your phone and convert them into a single pdf file. Gradescope will only allow pdf files to be uploaded.

- **You must show all work**. You may receive zero or reduced marks for insufficient work. **Your work must be neatly organised and written**. You may receive zero or reduced marks for incoherent work.

- If you are writing your answers on anything other than this sheet, you should only have **one question per page**. You can have parts a), b) and c) on the page for example, but problems 1) and 2) should be on separate pages.

- When uploading to Gradescope, **you must match each question to the page that your answer appears on**. If you do not you will be docked a significant portion of your score.

- **Put a box or circle around your inal answer** for each question.

- These problems are designed to be done without a calculator. Whilst there is nothing stopping you using a calculator when working through this assignment, be aware of the fact that you are not permitted to use calculators on exams so you might want to practice without one.

Problem 1: Calculate the following limits.

(a) $\displaystyle\lim_{y \to 1} \frac{\sqrt[3]{y} - 1}{y - 1}$

(b) $\displaystyle\lim_{x \to 0} \frac{x \cos(x) - \sin(x)}{\sin(x) - x}$

(c) $\lim\limits_{x \to 1} \tan\left(\dfrac{\pi x}{2}\right) \ln(x)$

(d) $\lim\limits_{t \to 0^+} \csc(t)^{\arccos(t)/\ln(t)}$

Problem 2: Find the critical points of the following functions.

(a) $f(x) = x^2 - 6x + 7$

(b) $v(t) = 6t^2 - t^3$

For the next two, use the chain rule and factor out the greatest common factor. Then the rest of the factoring should be clear.

(c) $h(s) = s(4 - s)^3$

(d) $k(y) = (y - 1)^2(y - 3)^2$

Problem 3: Find the critical points of the following functions.

(a) $g(z) = z^2 + \dfrac{2}{z}$

(b) $r(t) = \dfrac{t^2}{t-2}$

(c) $q(a) = a^2 - 32\sqrt{a}$

(d) $p(x) = \sqrt{2x - x^2}$

Problem 4: Find the critical points of the following functions and classify them as local maximums, local minimums or neither.

(a) $f(x) = x^2 \ln(x)$

(b) $h(y) = y \ln(y)$

(c) $u(t) = e^t + e^{-t}$

(d) $g(z) = \arccos\left(z^2\right)$

Problem 5: For the following functions, find the absolute maximum and minimum on the given interval.

(a) $f(x) = 4 - x^3$ on $[-2, 1]$

(b) $g(x) = \sqrt{4 - x^2}$ on $[-2, 1]$

(c) $s(t) = 2 - |t|$ on $[-1, 3]$

(d) $h(y) = ye^{-y}$ on $[-1, 1]$