

# MAC 2311 Calculus—Analytic Geometry

## Homework #1

Please hand in your solutions by September 28, 2006, 8 p.m.  
Solutions that are handed in later will be graded with 0 points.

Throughout,  $\lambda$  denotes a number which is given by the first letter of your first (given) name as specified in following table:

1 <sup>st</sup> letter	A...D	E...I	J...M	N...R	S...W	X...Z
$\lambda$	2	3	4	5	6	7

For instance, if your first name is Emily or Geff, you set  $\lambda := 3$ .

**Problem 1: Limits (6P)** Determine whether the following limits exists. If a limit exists, determine its value. If you think that a limit does not exist, give a proof for your claim.

- $\lim_{x \rightarrow 1} \frac{(x-1)^\lambda}{x^2(x+2)}$
- $\lim_{x \rightarrow 0} \frac{|\lambda \cdot x|}{x/\lambda}$
- $\lim_{x \rightarrow \lambda^+} \sqrt{x - \lambda} \cdot e^{\sin(\pi/(x-\lambda))} + 2^\lambda$

**Problem 2: Tangent (6P)** Consider the function

$$f(x) := \left(\frac{1}{x} - 2\right)^3 + \lambda^2 \cdot x - 2.$$

Denote by  $P$  the point on the graph of  $f$  with  $x$ -coordinate equal to  $\lambda$ . Compute the defining equation of the tangent to  $f$  in the point  $P$ .

**Problem 3: Continous functions (4P)** Determine all  $x$ -values where the following function is discontinuous:

$$f(x) = \begin{cases} x + 2 & \text{if } x < 0 \\ e^x & \text{if } 0 \leq x \leq \lambda \\ 2 - x & \text{if } x > \lambda \end{cases}$$

**Problem 4: Derivatives (4P)** Determine the derivative  $f(x)'$  of the following functions  $f(x)$ —simplify your answer:

- $f(x) = \frac{x}{x + \frac{\lambda}{x}}$
- $f(x) = x^{x/\lambda}$
- $f(x) = (\sin(\sqrt{x + \lambda}) - \cos(x - \lambda))^4$

**Good luck & have fun!!!**