UNIVERSITY OF LEICESTER

MA1014
CALCULUS AND ANALYSIS
TUTORIAL 14

Dr. Andrew Tonks: apt12@le.ac.uk

Ben Smith: bjs30@le.ac.uk

ANNOUNCEMENTS

- Coursework Deadline: 23rd November (13:00 GMT)

L'HÔPITAL'S RULE

If the functions $f(x)$ and $g(x)$ are differentiable on an interval $I = (a, b)\backslash\{c\} : c \in (a, b)$ and

$$\lim_{x \to c} f(x) = \lim_{x \to c} g(x) = 0 \text{ or } \pm\infty$$

Then,

$$\lim_{x \to c} \frac{f(x)}{g(x)} = \lim_{x \to c} \frac{f'(x)}{g\prime(x)}$$

(If the second limit/RHS exists!)

EXAMPLE

Determine

$$\lim_{x \to 0} \frac{e^{2x} - 1}{x}$$

EXERCISE:
DETERMINE THE FOLLOWING LIMITS

a. $\lim_{x\to 0} f(x) = \begin{cases} x^2 - 1, & x > 0 \\ -\cos(x), & x \leq 0 \end{cases}$

b. $\lim_{x\to 2} g(x) = \begin{cases} 2\sin(2-x) - 4, & x \leq 2 \\ -2x, & x > 2 \end{cases}$

c. $\lim_{x\to 0} h(x) = \dfrac{\cos(x)\sin(x)}{x}$

d. $\lim_{x\to 0} y(x) = \dfrac{e^x - 1}{\sin(2x)}$

EXERCISE

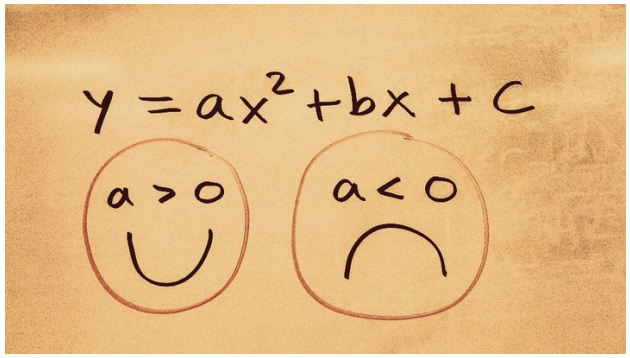
Evaluate:

a) $\lim_{x \to -\infty} \frac{x^2}{e^{-x}}$

b) $\lim_{x \to 0^+} (\sin(x))^x$

c) $\lim_{x \to 0} \frac{x}{\arctan(2x)}$

UNIVERSITY OF LEICESTER



$$\frac{d}{dx}\int_a^x f(t)\,dt = f(x)$$

$$\int_a^b f(x)dx = F(b) - F(a)$$

L

ANY QUESTIONS?

$$m\frac{d^2x}{dt^2} = -kx$$

$$\int \frac{dx}{1+x^2} = \tan^{-1}(x) + C$$