

# Antiderivatives <sup>1</sup>

1. Enter the following sequence commands and press Enter. This is an example of a *symbolic* computation.

- (a) `syms x`
- (b) `int(x^2)`
- (c) `diff(ans)`
- (d) Explain exactly what happened.

2. Repeat steps (b)-(c) for the more complicated function:

$$\frac{x}{(x-1)(x+2)(x^2-1)(x+1)}$$

(Type: `int(x / ((x-1)*(x+2)*(x^2-1)*(x+1)))` for command(b))  
Then enter the commands: `simplify(ans)` and `pretty(ans)`

3. It is a fact there not every function has an antiderivative which can be written as a combination of the usual (elementary) functions. Sometimes MATLAB will give a warning when it encounters such a function. Repeat the above sequence for the following functions:

- (a)  $\ln(\sin(x^2))$  type: `int(log(sin(x^2)))`
- (b)  $\exp(1 + 3x + x^5)$  type: `int(exp(1+3*x+x^5))`

4. Sometimes MATLAB will give an answer that involves another problem, such as solving an equation. Try:

$(1 + 3x + x^5)^{-1}$  type: `int(1/(1 + 3*x + x^5))`

5. Prepare a brief (< 1 page) written report, including answers to the questions. Do **not** get a printout. Use standard mathematical notation and terminology. Writing quality will play a part in the grade.

This assignment introduces the command for symbolic integration or antiderivatives. MATLAB can do some fairly sophisticated antiderivatives, but it is not able to find an antiderivative for some functions. This is not MATLAB's fault, rather it is a fundamental fact that not all functions have an antiderivatives that are elementary functions (combination of polynomial, exponential, trig., etc.).

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