This assignment is worth a total of 20 points. If you have questions or concerns regarding the course content, please email Leroy at *leroy_jia@brown.edu* or visit his office hours at 170 Hope St. You must show all work for full credit. Be sure to upload any MATLAB scripts you used as well as their output.

1 Taylor series review

For each of the following functions, write down the first n terms of the Taylor series centered at $a = 0$, where n is the smallest integer necessary to achieve an error of $\leq 1 \times 10^{-3}$ for $f(0.1)$, as guaranteed by the Lagrange error formula. Include the true and approximate values of $f(0.1)$ as well as the error in your writeup.

- $f(x) = e^{2x}$
- $f(x) = \sqrt{1+x}$
- $f(x) = \log(\cos x)$

2 Vector/array operations

a) Create a vector that stores all of the even numbers between 6 and 79 (inclusive). Note that 79 is not even.

b) Create an array that holds the dollar value for all of the clues in a round of Jeopardy (Figure 1). Once you make this array, use it to calculate the total amount of money on the board.

$200	$200	$200	$200	$200	$200
$400	$400	$400	$400	$400	$400
$600	$600	$600	$600	$600	$600
$800	$800	$800	$800	$800	$800
$1000	$1000	$1000	$1000	$1000	$1000

Figure 1: The board used in the game show Jeopardy.

c) Given the vectors `x = [1 4 8]` and `y = [2 1 5]` and array `A = [3 1 6; 5 2 7]`, determine which of the following commands will execute properly in MATLAB. For the ones that are legal, state what the result is; for the commands that give errors, explain what the source of the error is.

- `x * y`
- `x .* y`
- `x * y'`
- `x + y'`
- `[x ; y]`
- `A - [x' y']`
- `A - 3`
- `A + A'`
- `x * A * y'`

3 Loss of significance error

Consider the function $f(x) = \sqrt{1+x^2} - 1$. When MATLAB is asked to evaluate this function at $x = 1.89 \times 10^{-9}$, it incorrectly returns 0. Explain how this error comes about. Then, rewrite $f(x)$ into an equivalent expression that returns a nonzero answer. (Hint: find a form that doesn't involve subtraction).

4 Self-introduction

Run the file `interview.m`. There is no coding or math necessary for this problem, although you are free to read the code to see how it works. Simply answer the questions that appear in the command window truthfully by typing in your responses. Submit the exported .txt file for full credit on this problem.