

All work is to be done in a mathematica or jupyter notebook.

Please refer to the blackboard site for commands and examples.

Submissions must be made electronically on Blackboard.

You will be graded on the output that I am able to generate from your commands.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

1. Let a be the digit corresponding to your first initial in the table above. Consider the function

$$f(x) = \sqrt{\frac{x^4 - x + a}{x^4 + x + a}}$$

- Graph the function on an appropriate interval.
- Compute the derivative of the function.
- Simplify the derivative and say in words what changed from part 1b.
- Find the points on the graph where the function f has a horizontal tangent.
- Graph f and f' on the same axis. Explain in words why or why not your graphs are consistent with the answer found in part 1d

2. Consider the curve (Tschirnhausen Cubic), where a is as defined above,

$$y^2 = x^3 + ax^2.$$

- Graph the equation. I would suggest ContourPlot for Mathematica, plot_implicit for sympy python, or breaking into two pieces. Describe in words what you see.
- Where does the graph have horizontal tangents?
- Where does the graph have vertical tangents?
- Explain in words how the picture supports your mathematics.

3. Consider the function,

$$g(x) = e^{-x^2/(2\sigma^2)}.$$

- Start by setting $\sigma = a$. Find the asymptote, maximum value and inflection points. Plot the function and the points identified.
- Change $\sigma = 2a$. Describe in words the changes you observe to all values found in 3a.
- Graph at least four different values of σ to verify your predictions in 3b.