MATH 3025 NAME: _____

Mathematica Lab #2 Due Monday March 6th 2023 by 11:59 P.M.

All work is to be done in a programming notebook.
Please refer to the blackboard site for commands and examples.
Submissions must be made electronically to 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. Consider the function
$$h(x) = \frac{4x^3 - 27x^2 + 5x - 32}{30x^5 - 13x^4 + 50x^3 - 286x^2 - 299x - 70}$$
   (a) Find the partial fraction decomposition. The 'apart' command works nicely for this.
   (b) Integrate using the decomposition that you found.
   (c) Integrate using the original function.
   (d) Explain in complete sentences any discrepancies between the two.

2. Using the function $g(x) = \dfrac{\cos^2 x}{x^2}$.
   (a) Compute $\displaystyle\int_1^t g(x)\ dx$ for $t = 2, 5, 10, 100, 1000,$ and 10000.
   (b) In complete sentences, explain what would happen if $t \to \infty$.
   (c) Let $f(x) = \dfrac{1}{x^2}$. Graph both $g(x)$ and $f(x)$ on the same axis. Use your graph to explain why $\displaystyle\int_1^\infty g(x)\ dx$ is convergent. (Comparison Test)

3. Consider the curve $y = \log_a x$, where a is the first initial of you first name. (if $a = 1$, please use $a = e$, Euler's number)
   (a) Graph the curve from the points $(1, 0)$ to $(2, \log_a 2)$.
   (b) Calculate the length of the arc between those points. (It may be necessary to use nintegrate)