



MATH 152 – PYTHON LAB 2

Directions: Use Python to solve each problem, unless the question states otherwise. ([Template link](#))

- (More review from MATH 151) Given $f(x) = \frac{8x^3 + 9x^2 - 1}{12x^2 - 14x^3 + 7}$,
 - Use a for loop (list comprehension) to evaluate $f(x)$ at $x = 100, 1000, 10000, 100000,$ and 1000000 to estimate $\lim_{x \rightarrow \infty} f(x)$. (Look at the Lab Overview for MATH 151's Lab 2 to see an example of this.)
 - Plot $f(x)$ on the x -interval $[0, 5000]$ to get a better look.
 - Finally, use SymPy's limit command to compute $\lim_{x \rightarrow \infty} f(x)$.
- A jeweler is designing a metal bead that is sphere-shaped with a hole drilled through the center to the opposite side. The bead has radius r millimeters and the hole has a radius of 1 millimeter.
 - Find the volume $V(r)$ of the bead given radius r , using an integral, rotating around the axis parallel to the hole. Hint: there are two valid ways of setting this up.
 - Suppose the jeweler needs the bead to be made of exactly 140 cubic millimeters of metal. Find the radius r needed for such a bead. Give your answer as a decimal approximation using `evalf()`.
- Given $f(x) = \frac{1}{2}x^4$ and $g(x) = |x^2 - 14|$:
 - Plot the two functions on the same axes with x -interval $[-4, 4]$.
 - Find the points of intersection (approximate if necessary).
 - Find the area of the region enclosed by the two curves (approximate if necessary).
- Evaluate the following integrals.
 - $\int \tan^2(x) dx$
 - $\int x \tan^2(x^2) dx$
 - What strategy could you use to integrate (a) by hand?
What additional strategy could you use to integrate (b) by hand?