Math 152 – Python Lab 1

Directions: Use Python to solve each problem. (Template link)

1. Define variables $a = 1.54$ and $b = 3.78$, then evaluate the following:

   (a) $\dfrac{\sin^2(a) + \cos^2(a)}{b^2 + 1}$

   (b) $\dfrac{(\sin(a) + \cos(a))^2}{b^2 + 1}$

   State whether or not the answers to (a) and (b) are equal. One or both of the expressions can be simplified using a well-known trigonometric identity. Give the simplified expression(s).

2. A very useful identity this semester will be the power reducing formula for $\sin(\theta)$, which is $\sin^2(\theta) = \dfrac{1 - \cos(2\theta)}{2}$.

   (a) Verify this identity when $x = \dfrac{3\pi}{4}$.

   (b) Plot $f = \sin^2(x) - \dfrac{1 - \cos(2x)}{2}$ on $[0, 2\pi]$. Since this is a trigonometric identity, $f(x)$ should be 0 for all x. If you do not get $y = 0$, explain why.

3. Given $f(x) = -x^3 - 2x^2 + 5x$ and $g(x) = x$:

   (a) Graph both functions on the same set of axes in a domain and range that let's you see all points of intersection.

   (b) Find the exact and approximate area between these curves. (NOTE: if the absolute value method does not work, you'll have to split it up as you do by hand!)

4. Given $f(x) = 5x^2(x^3 - 7)^{1/2}$:

   (a) Make an appropriate substitution to change $\int f(x)dx$ to a function of u and integrate this function.

   (b) Confirm your answer to part (a) by integrating $\int f(x)dx$ directly. Show that your answers for part (a) and (b) are the same.

   (c) Use the definite integral from part (b) and the Fundamental Theorem of Calculus to evaluate $\int_2^3 f(x)dx$ (give exact and approximate answers).

   (d) Check your answer to part (c) by using Python to directly evaluate $\int_2^3 f(x)dx$.

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