



MATH 152 – PYTHON LAB 6

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

1. The **Laplace Transform** of a continuous function $f(t)$ is given by

$$F(s) = \int_0^{\infty} f(t)e^{-st} dt.$$

(You'll use this plenty in differential equations!) Find the Laplace Transform for the following functions. In order to simplify, assume s and t are positive.

- (a) $f(t) = 1$
- (b) $f(t) = t$
- (c) $f(t) = t^4$
- (d) $f(t) = \cos(t)$

2. Given the sequence $a_n = \left(\frac{n+1}{n}\right)^n$:

- (a) Find the first 10 terms of the sequence (as approximate decimals) and guess the value of the limit based on these values.
- (b) Plot the first 50 terms of the sequence and guess the value of the limit based on the graph.
- (c) Find the limit of the sequence directly using **sp.limit**.

3. Given the sequence defined recursively via

$$a_1 = 1 \quad \text{and} \quad a_{n+1} = 1 + \frac{1}{1 + a_n}$$

- (a) Find the first 10 terms of the sequence (as approximate decimals) and guess the value of the limit based on these values.
- (b) Plot the first 50 terms of the sequence and guess the value of the limit based on the graph.
- (c) Find the limit of this recursive sequence.