

Solve the problem below and submit your answer on Gradescope.

You can submit your answer in whatever file format you prefer. For example, you could save your code in a text file and submit that, or you could screenshot, or you could submit a PDF export of a Jupyter Notebook.

Problem 1

[JULIA]

The Babylonian method for approximating \sqrt{x} works as follows. We begin with $t_0 = 1$, and for $n \geq 1$, we define $t_n = \frac{1}{2}(t_{n-1} + x/t_{n-1})$. As $n \rightarrow \infty$, t_n converges to \sqrt{x} quite quickly.

(a) Write a Julia function `babylonsqrt` which takes `x` as an argument and computes the 20th iterate of the above sequence (in other words, t_{20}) for the given value of `x`.

```
@assert isapprox(babylonsqrt(5), sqrt(5))
```

(b) Show that if you apply the Babylon square root algorithm with 20 iterations to `[5 1; 0 5]`, you get

$$\begin{bmatrix} 2.2361 & 0.2236 \\ 0.0 & 2.2361 \end{bmatrix}.$$

You will have to alter your function a bit so that it works for matrices. For example, the iteration should start at `I` instead of 1, and x/t should be replaced with `x*inv(t)`.

(c) Interpret the top-right entry 0.2236.