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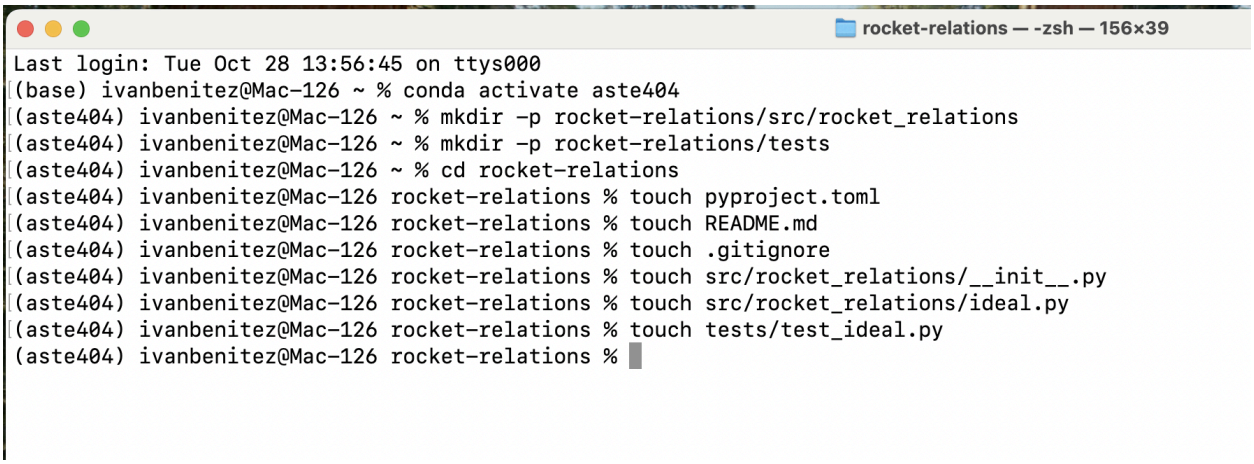
Professor Depew
ASTE475
29 October 2025

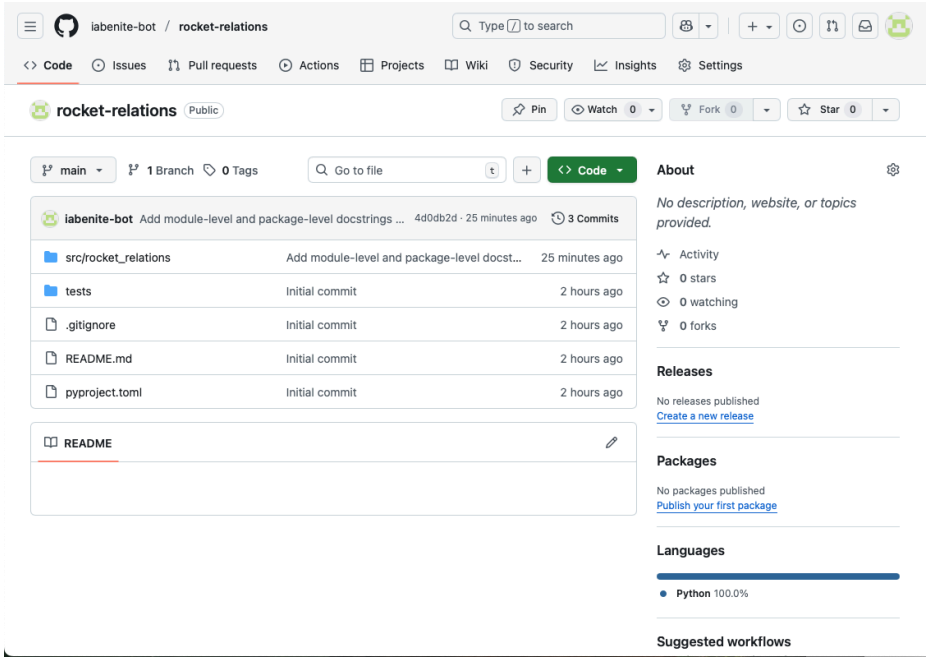
Homework 5 Report

Part 1:

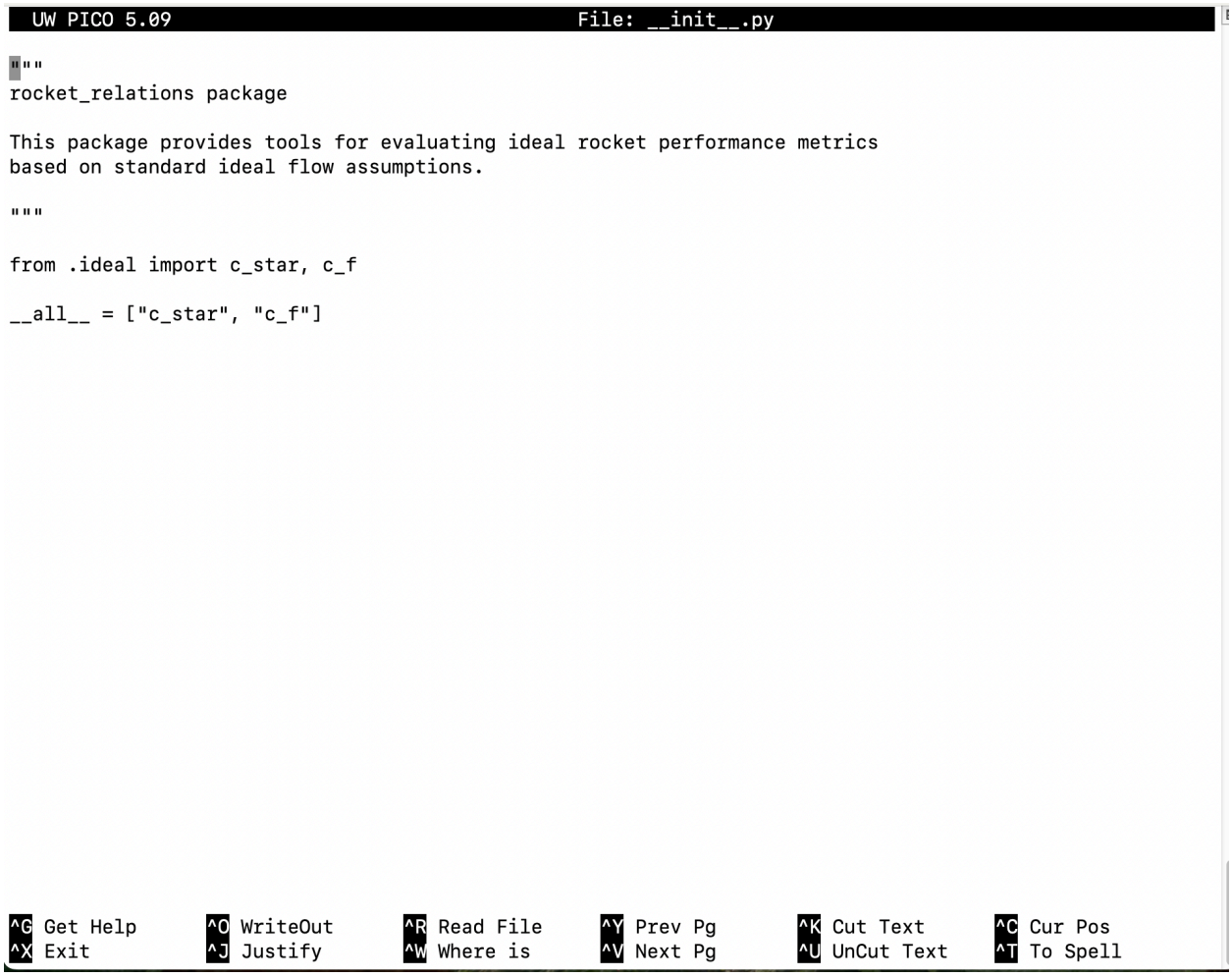
a) Part a was simple, it was just making the directory layout for the assignment. I didn't have any trouble completing this part.



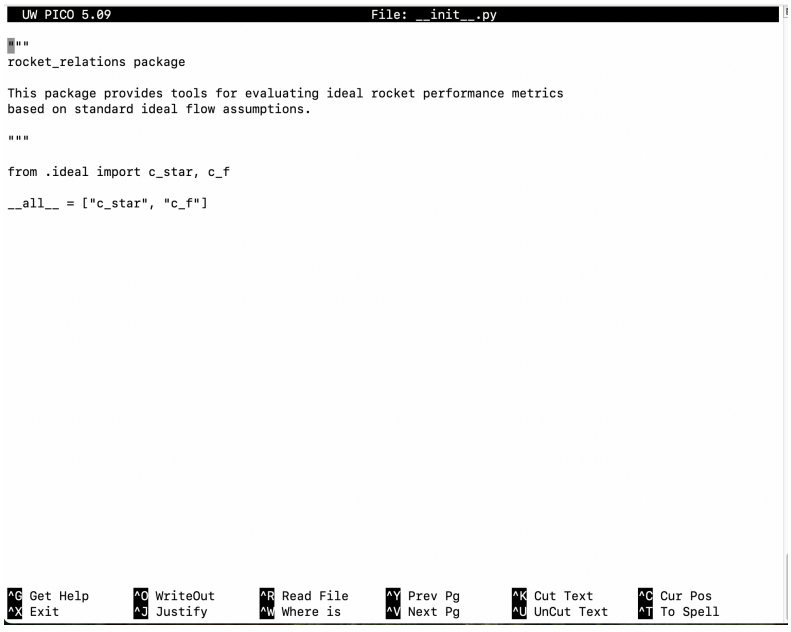
b) Part b was also simple, it was similar to the last homework. I ran into no issues here



c) This part of the assignment was difficult. I spent a majority of the time here because of the expensive googling I had to do. I eventually got it completed though.



d) Part d was simple, I just followed the instructions.



e) Part e also wasn't too difficult. I did not struggle much completing it.

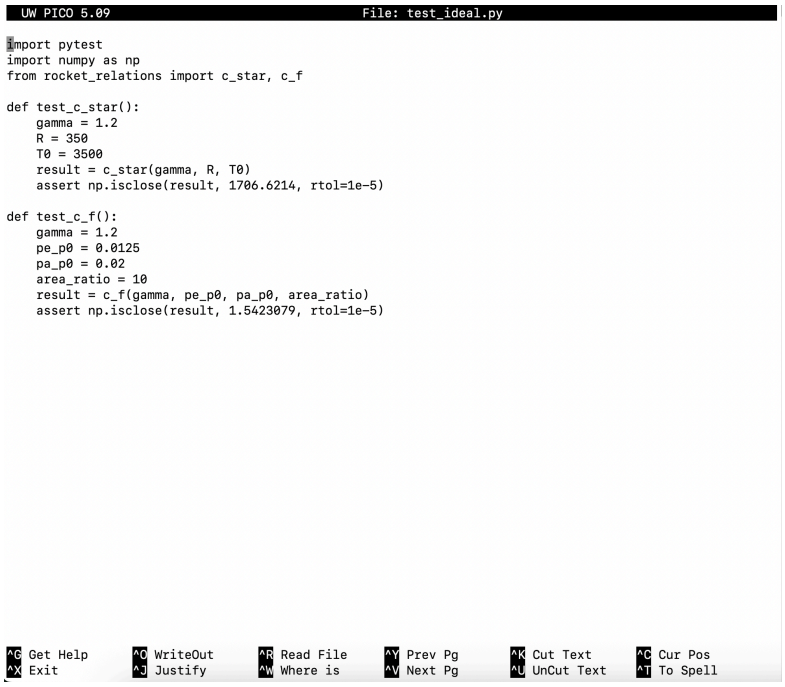
```
 UW PICO 5.09                                File: pyproject.toml

[build-system]
requires = ["hatchling >= 1.26"]
build-backend = "hatchling.build"

[project]
name = "rocket-relations"
version = "0.1.0"
description = "Basic ideal rocket relations"
readme = "README.md"
requires-python = ">=3.10"
dependencies = ["numpy"]
```

```
(aste404) ivanbenitez@Mac-126 rocket-relations % python
Python 3.13.7 | packaged by conda-forge | (main, Sep  3 2025, 14:24:46) [Clang 19.1.7 ] on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>> from rocket_relations import c_star, c_f
>>> gamma = 1.2
>>> R = 287
>>> T0 = 3000
>>> c_star(gamma, R, T0)
np.float64(1430.7729507626036)
>>>
```

f) Part f took some time but I was able to figure it out with some googling.




```
(aste404) ivanbenitez@Mac-126 rocket-relations % pytest
========================================= test session starts ==========================================
platform darwin -- Python 3.13.7, pytest-8.4.2, pluggy-1.6.0
rootdir: /Users/ivanbenitez/rocket-relations
configfile: pyproject.toml
plugins: anyio-4.11.0
collected 2 items

tests/test_ideal.py ..                                                                          [100%]

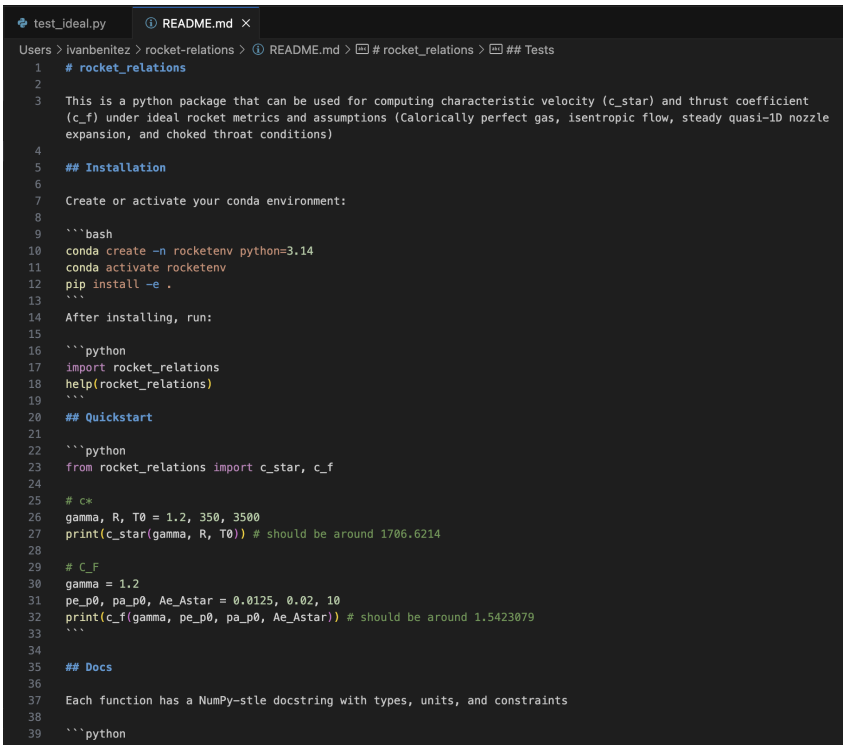
========================================== 2 passed in 0.08s ===========================================
(aste404) ivanbenitez@Mac-126 rocket-relations %
```

```
(aste404) ivanbenitez@Mac-126 ~ % cd rocket-relations
(aste404) ivanbenitez@Mac-126 rocket-relations % git status
On branch main
Your branch is up to date with 'origin/main'.

Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
        modified:   pyproject.toml
        modified:   tests/test_ideal.py

no changes added to commit (use "git add" and/or "git commit -a")
(aste404) ivanbenitez@Mac-126 rocket-relations % git add src/rocket_relations/ideal.py
(aste404) ivanbenitez@Mac-126 rocket-relations % git add tests/test_ideal.py
(aste404) ivanbenitez@Mac-126 rocket-relations % git commit -m "Add tests for c_star and c_f"
[main a1f394a] Add tests for c_star and c_f
 1 file changed, 18 insertions(+)
(aste404) ivanbenitez@Mac-126 rocket-relations % git push
Enumerating objects: 7, done.
Counting objects: 100% (7/7), done.
Delta compression using up to 12 threads
Compressing objects: 100% (3/3), done.
Writing objects: 100% (4/4), 525 bytes | 525.00 KiB/s, done.
Total 4 (delta 1), reused 0 (delta 0), pack-reused 0 (from 0)
remote: Resolving deltas: 100% (1/1), completed with 1 local object.
remote: This repository moved. Please use the new location:
remote:   https://github.com/iabenite-bot/rocket-relations.git
To https://github.com/iabenite-bot/Rocket-Relations.git
   4d0db2d..a1f394a  main -> main
(aste404) ivanbenitez@Mac-126 rocket-relations %
```

g) Part g also took some time but it was simple tying everything together in the README file.



test_ideal.py | README.md

Users > ivanbenitez > rocket-relations > README.md > # rocket_relations > ## Tests

```
# rocket_relations

This is a python package that can be used for computing characteristic velocity (c_star) and thrust coefficient
(c_f) under ideal rocket metrics and assumptions (Calorically perfect gas, isentropic flow, steady quasi-1D nozzle
expansion, and choked throat conditions)

## Installation

Create or activate your conda environment:

```bash
conda create -n rocketenv python=3.14
conda activate rocketenv
pip install -e .
```
After installing, run:

```python
import rocket_relations
help(rocket_relations)
```
Quickstart

```python
from rocket_relations import c_star, c_f

# c*
gamma, R, T0 = 1.2, 350, 3500
print(c_star(gamma, R, T0)) # should be around 1706.6214

# C_F
gamma = 1.2
pe_p0, pa_p0, Ae_Astar = 0.0125, 0.02, 10
print(c_f(gamma, pe_p0, pa_p0, Ae_Astar)) # should be around 1.5423079
```

Docs

Each function has a NumPy-stle docstring with types, units, and constraints

```python
```

```
(aste404) ivanbenitez@Mac-126 rocket-relations % git add README.md
(aste404) ivanbenitez@Mac-126 rocket-relations % git commit -m "Add README with install, quickstart, docs, and test instructions"
[main 50ebcbb] Add README with install, quickstart, docs, and test instructions
 1 file changed, 54 insertions(+)
(aste404) ivanbenitez@Mac-126 rocket-relations % git push
Enumerating objects: 5, done.
Counting objects: 100% (5/5), done.
Delta compression using up to 12 threads
Compressing objects: 100% (3/3), done.
Writing objects: 100% (3/3), 868 bytes | 868.00 KiB/s, done.
Total 3 (delta 1), reused 0 (delta 0), pack-reused 0 (from 0)
remote: Resolving deltas: 100% (1/1), completed with 1 local object.
remote: This repository moved. Please use the new location:
remote:   https://github.com/iabenite-bot/rocket-relations.git
To https://github.com/iabenite-bot/Rocket-Relations.git
   a1f394a..50ebcbb  main -> main
(aste404) ivanbenitez@Mac-126 rocket-relations %
```
```

h) Part h was very interesting and probably my favorite part of the assignment. It was something I've never done before so I had to do some research but I eventually was able to get everything documented via Sphinx.