

Computational Physics  
PHYS 3800

Homework 03

# Rocket Propulsion

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## Abstract

Abstract goes here

## 1 Introduction

## 2 Theory

## 3 Computational Method & Techniques

$$\frac{dv}{dt} = \frac{Ru_{ex}}{m_i - Rt} - g \quad (1)$$

$$\int dv = \int \frac{Ru_{ex}}{m_i - Rt} - \int g dt \quad (2)$$

$$v_f - v_o = Ru_{ex} \int \frac{1}{m_i - Rt} dt - gt \quad (3)$$

pull out the mass

$$v = Ru_{ex} \int \frac{1}{1 - \frac{Rt}{m_i}} dt - gt \quad (4)$$

Apply Integral substitution denoted with p

$$p = 1 - \frac{Rt}{m_i} \quad dp = -\frac{R}{m_i} dt$$

$$\int \frac{1}{u} \left(-\frac{m_i}{R}\right) du \quad (5)$$

$$-\frac{m_i}{uR} \quad (6)$$

$$\int -\frac{m_i}{Ru} du \quad (7)$$

Take the constant out

$$-\frac{m_i}{R} \int \frac{1}{u} du \quad (8)$$

$$= -\frac{m_i}{R} \ln|u| \quad (9)$$

$$= -\frac{m_i}{R} \ln \left| \frac{1}{1 - \frac{Rt}{m_i}} \right| \quad (10)$$

## 4 Results

## 5 Conclusion