## Written Homework 1

Recommended textbook problems (do not submit - see detailed solutions on Canvas):
Textbook Sec 1.1: problems 5, 14, 22, 32, 42; Sec 1.2: problems 2, 9, 18, 30, 40
There are three required exercises total. Textbook references: Section 1.1 and 1.2.

## Exercise 1

(a) Verify that the function $y(x)=x+C x^{-2}$ is a solution of the differential equation $x y^{\prime}+2 y=3 x$ (by substituting $y(x)$ and $y^{\prime}(x)$ into the differential equation).
(b) In addition, find the value of $C$ so that we have $y(1)=5$.

## Exercise 2

Find a function $y=f(x)$ that satisfies the initial value problem

$$
y^{\prime}=(2+5 x) e^{\left(\frac{x}{3}\right)}, y(0)=5 .
$$

Hint: integration by parts.

## Exercise 3

A ball of mass 4 kg is thrown upward from the ground with a velocity of $v=30 \mathrm{~m} / \mathrm{s}$ on Mars, where the acceleration of the gravity is $g=-3.7 \mathrm{~m} / \mathrm{s}^{2}$.
(a) How long is the ball in the air on Mars?
(b) How much longer is the ball in the air on Mars than on Earth, where $g=-9.8 \mathrm{~m} / \mathrm{s}^{2}$ ?

Hint: See Sec 1.2 "Velocity and Acceleration" and Example 3.

