NOTE[1]

The due date is published on the course pages. Homework can be submitted only digitally. Instructions on labelling the "papers" can be found on the course pages.

1 Introductory Problems

INTRO 17   Solve

$$\frac{dy}{dx} = \frac{y}{2x}.$$

INTRO 18   Solve

$$\frac{dy}{dx} - \frac{2y}{x} = x^2.$$

2 Homework Problems

EXERCISE 17   Newton's Second Law of Motion states that

$$mg - kv = m\frac{dv}{dt},$$

where mg is the gravitational force, and kv is the air resistance, acting upwards, so $k > 0$. Here it is assumed that the object in question is very small, for instance, a dust particle settling on a computer component during manufacturing. Having the air resistance proportional to

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velocity is a reasonable model in this case. Assuming that the object starts from rest, determine its terminal velocity.

EXERCISE 18   The total number of people infected with a virus often grows like a logistic curve. Suppose that time t is in weeks and that 10 people originally have the virus. In the early stages, the number of people is increasing exponentially with $k = 1.78$. In the long run, 5000 people are infected.

(a) Find a logistic function to model the number of people infected.

(b) Find the point in time when the rate of infections starts to decrease. How many people have been infected at that point?