

# Homework Four

## Calculus I

### College of the Atlantic

Due Friday, October 7, 2022

There are two parts to this assignment.

**Part 1: WeBWorK.** Do Homework 04A, 04B, and 04C on WeBWorK. The WeBWorK page is here: <https://webwork.runestone.academy/webwork2/coa-feldman-es1024i-fall-2022/>. I recommend doing the WeBWorK part of the homework first. This will enable you to benefit WeBWorK's instant feedback before you do part two.

**Part 2: Non-WeBWorK problems.** Here are some instructions for how to submit this part of the assignment.

- Do the problems by hand using pencil (or pen) and paper. There is no need to type this assignment.
- Make a pdf scan of your work using genius scan or some similar scanning app. Please make the homework into a single pdf, not multiple pdfs.
- Submit the assignment on google classroom. Please don't email it to me.
- If you want, you can do the non-WeBWorK problems in pairs and submit only one assignment for the two of you.

Here are some non-WeBWorK problems.

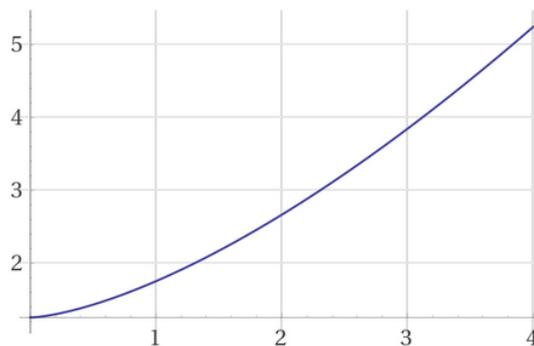


Figure 1: The position of a object (in meters) as a function of time (in seconds).

1. An object's position as a function of time is shown in Fig. 1. Use this graph to estimate:
  - (a) The average speed between  $t = 1$  and  $t = 3$ .
  - (b) The average speed between  $t = 1$  and  $t = 2$ .

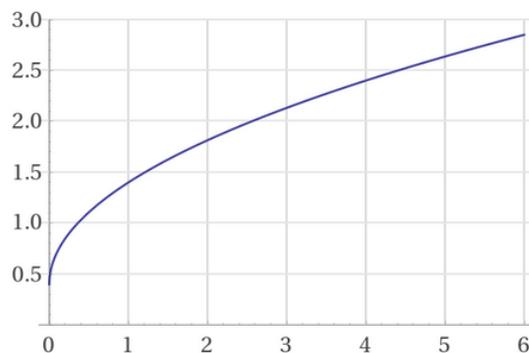


Figure 2: The position of a object (in meters) as a function of time (in seconds).

2. An object's position as a function of time is shown in Fig. 2. On this graph draw:
  - (a) A line whose slope is equal to the average speed of the object from  $t = 1$  to  $t = 4$ .
  - (b) A line whose slope is equal to the instantaneous speed at  $t = 3$ .
  
3. The position of a cat is given by  $s(t) = t^3 + 2$ , where  $t$  is measured in seconds and  $s$  is measured in meters.
  - (a) Find the average speed of the cat between time 2 and time  $2 + h$  if:
    - i.  $h = 0.1$
    - ii.  $h = 0.01$
    - iii.  $h = 0.100$
  - (b) What do you think is the instantaneous speed of the cat at time  $t = 2$ ?
  
4. Find the derivative of  $f(x) = x^3 + 2$  at  $x = 2$  using algebra. That is, start with the definition of the derivative:

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(2+h) - f(x)}{h} . \quad (1)$$

Then use algebra to simplify the expression on the right. After a bit of work, the  $h$  downstairs will cancel and you'll be able to evaluate the limit. Do not use any shortcuts you might have learned in other classes, nor should you use a calculator to plug in values of  $h$ .

5. Repeat the above problem, but instead find the derivative of  $g(x) = 1/x$  at  $x = 3$ . (This problem will involve a good bit more algebra than the last one.)