INTRODUCTION TO CALCULUS

MATH 1A

Unit 1: Worksheet

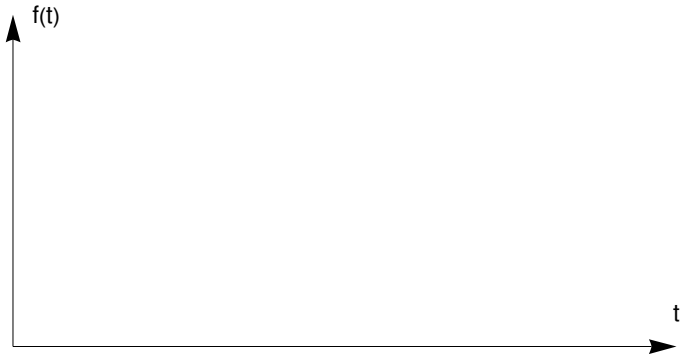
Problem 1):

a) Pick your favorite ball:

- tennis
- golf
- soccer
- baseball
- softball
- lacrosse
- marble
- pinball

Explain to your neighbors why you made your pick.

b) Imagine to throw the ball and display its trajectory $f(x)$ as a function of time x. Draw a possible trajectory.



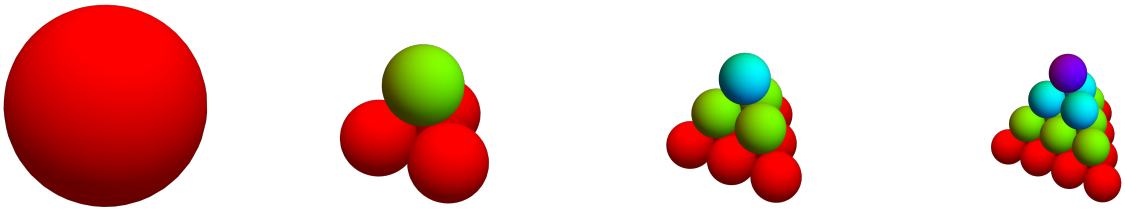
c) Identify parts of the graph, where the function is increasing, decreasing, where it is concave down and concave up.

d) If you would play with the ball on the moon rather than the earth. How would that change the trajectory? How would the concavity change?

e) Identify the units of $x, f(x)$ the unit for the slope and concavity have?

Problem 2): If we stack oranges onto each other, we are led to **tetrahedral numbers**. Can you find the next number?

1	4	10	20	35	56	84	120	...



n=1 n=2 n=3 n=4

Problem 3): How does the following sequence

0	6	24	60	120	210	336	504	...

continue? We look at this as a function $f(1) = 0, f(2) = 6, \ldots, f(8) = 504$. What is the next term $f(9)$?

Problem 4): When adding the first integers we get the so called **triangular numbers**. This sequence defines a **function** on the natural numbers. For example, $f(4) = 1 + 2 + 3 + 4 = 10$. Can you guess a formula for $f(x)$?

1	3	6	10	15	21	36	45	...

n=1 n=2 n=3 n=4