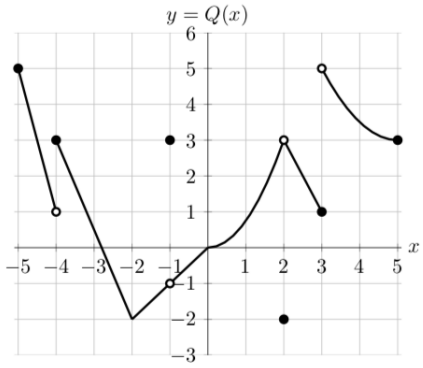
Math 115 Fall 2018
Worksheet 3 – Section 1.3

Making new functions from old ones

Problem 1 (Fall 2017 Exam 1 Problem 4)**.** The graph of a function $Q(x)$ with domain $[-5, 5]$ is shown below.



(a) On which of these intervals is Q invertible? Circle <u>all</u> that are true.

$[-4, -1]$ $[-2, 3]$ $[2, 5]$ $[-2, 2]$ None of these.

(b) For which values of $-5 < x < 5$ is the function Q not continuous?

Problem 2 (Winter 2018 Exam 1 Problem 2)**.** A group of divers recently discovered one of the most submerged caverns in the world. As part of the exploration team, Elena descended into the caverns to take measurements of the temperature and pressure at different depths in the water. Elena started her descent at 8 am and reached the bottom of the caverns at 8:30 am. Let

- $A(t)$ be Elena's depth (in meters) during her descent t minutes after 8 am,
- $B(p)$ be the depth (in meters) at which Elena measures a water pressure of p kPa (kiloPascals),
- C(m) be the water temperature (in degrees Celsius) at a depth of m meters.

Assume all these functions are invertible.

(a) Find mathematical expressions that represent each of the sentences below.

(i) The temperature of the water in degrees Celsius when its pressure is 118 kPa.

(ii) The water pressure, in Pascals, 2 meters under the water surface (1 kPa =1000 Pascals).

(b) At 8:02am, Elena started recording all the data that she was measuring. Let $F(x)$ be Elena's depth (in meters) x seconds after she started recording data. Find a formula for $F(x)$ in terms of any of the functions A, B or C.

Problem 3. Consider the graph of the function m below.

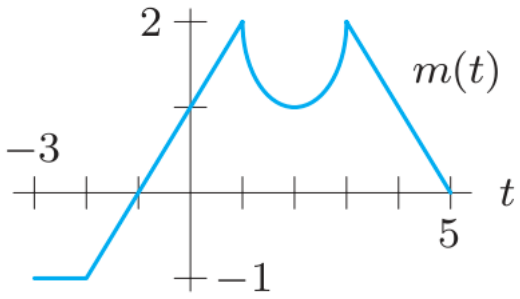


Figure 1: Graph of m

(a) What is the domain of m?

(b) What is the range of m?

(c) On which interval(s) is the function constant?

(d) On which interval(s) is the function linear?

(e) On which interval(s) is the function increasing?

(f) On which interval(s) is the function decreasing?

(g) Graph the following functions:

$$\text{(i) } n(t) = m(t) + 2, \quad \text{(ii) } k(t) = m(t+1), \quad \text{(iii) } z(t) = 2m(t) - 2$$