1. [11 points] Consider the following functions described below:

a. [7 points] Water is added into an empty tank at a rate of 9 gallons per minute until it is full. Once the tank is full, the water is shut off. The tank is 5 ft tall and has capacity to store 180 gallons of water. During the time the water is entering the tank, let $H(t)$ be the depth of water (in ft) in the tank t minutes after it starts to be filled with water.

   i) [1 points] How long does it take for the tank to be filled? _____

   Solution: $\dfrac{180}{9} = 20$ minutes.

   ii) [4 points] Given that the function $H(t)$ is only defined during the time that water is being added into the tank, find the domain and range of the function $H(t)$? Write your answers in interval notation or with inequalities.

   Solution: Domain: $[0, 20]$ or $0 \leq t \leq 20$,   Range: $[0, 5]$ or $0 \leq H(t) \leq 5$.

   iii) [2 points] Is the function $H(t)$ increasing, decreasing or neither, during the time that water is being poured into the tank? Circle your answer.

   Solution: **INCREASING**   Decreasing   Neither

b. [4 points] As part of an experiment, bacteria is deposited in a piece of raw meat. At first, the amount of bacteria grows slowly, but its rate of growth continues to increase. Let $B(t)$ be the amount of bacteria at time t (in hours). Which of the listed attributes could be true for the function $B(t)$ on its entire domain? Circle your answer.

Solution:

   INCREASING   Decreasing   Neither increasing or decreasing

   CONCAVE UP   Concave down   Neither concave up or concave down