

7. (4+2+3+6 points) You got a flight out, finally, but in your haste to leave, you locked Frosty the Snowman, Jr. in the warm greenhouse. Suppose  $r(t)$  is the rate in  $\text{cm}^3/\text{min}$  that the Frosty's volume is changing as he is trapped in the greenhouse. The time the doors of the greenhouse were closed corresponds to  $t = 0$ .

(a) Explain the meaning of the quantity  $\int_2^5 r(t)dt$  in the context of this problem.

(b) What do you expect the sign of  $r(t)$  to be for the meaningful domain of this problem? Why?

(c) If  $r(t) = 3t^2 - 432$ , what is the domain that makes sense for this problem? Why?

(d) Use the Fundamental Theorem of Calculus (and common sense) to determine the volume (in  $\text{cm}^3$ ) of Frosty, Jr. when the door to the greenhouse was closed. Show all of your work and reasoning.