

9. [10 points]

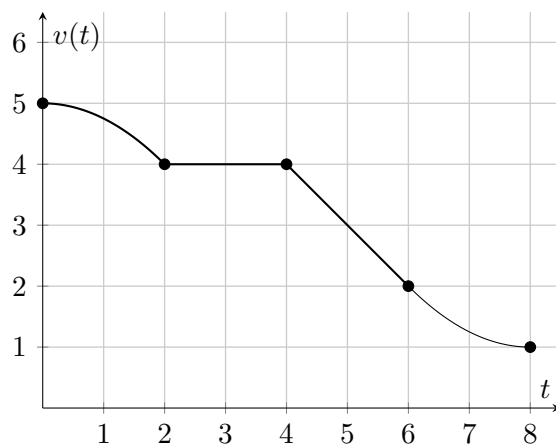
- a. [6 points] As a particle moves in the  $xy$  plane, it traces out the curve  $y = g(x)$  for  $1 \leq x \leq 5$ , where  $g(x)$  is the function

$$g(x) = \int_{2x}^{x^4} \sin(t^3) dt + 100e^\pi.$$

Set up, but do not evaluate, an expression with a *single* integral which gives the arclength of the path of the particle. Your answer should not involve the letter  $g$ .

- b. [4 points] A different particle is traveling with velocity given by  $v(t)$  meters/second, where  $v(t)$  is the function in the following graph: The units of  $t$  are seconds.

Graph of  $y = v(t)$



Using a left Riemann sum with four subdivisions, estimate the distance the particle travels in the first 8 seconds of its journey. Is this an underestimate or an overestimate of the actual distance traveled in the first 8 seconds? Justify your answer.