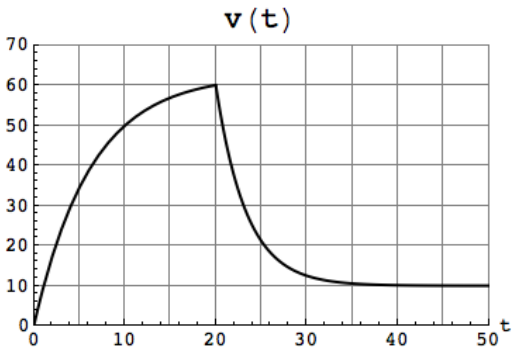
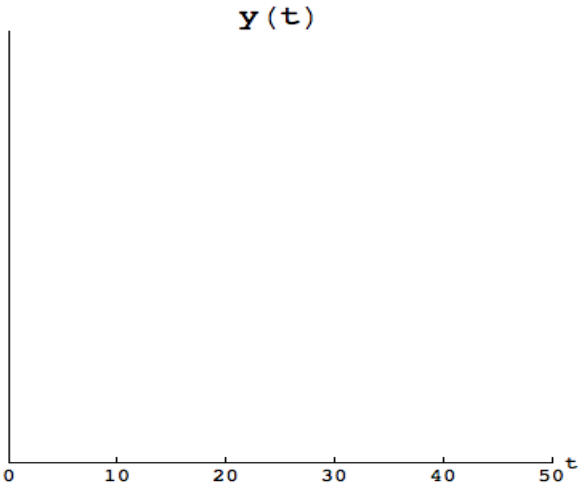
**5**. [14 points] A skydiver jumps from a plane at a height of 2,000 meters above the ground. After some time in free-fall, he opens his parachute, reducing his speed, and lands safely on the ground.

**a**. [5 points] The graph of the skydiver's downward velocity $v(t)$ (in meters per second) $t$ seconds after he jumped is shown below.
Sketch the graph of the antiderivative $y(t)$ of $v(t)$ satisfying $y(0) = 0$. Make sure your graph reflects the regions at which the function is increasing, decreasing, concave up or concave down.




**b**. [3 points] Write down a right-hand sum with 4 subintervals in order to approximate the **average** downward velocity of the skydiver during the time the skydiver is in free-fall. Show all the terms in your sum.

**c**. [2 points] Is your estimate in (**b**) guaranteed to be an underestimate or overestimate of the average velocity of the skydiver, or there is not enough information to decide? Justify.

**d**. [4 points] Find a formula for the height $H(t)$ (in meters) above the ground of the skydiver $t$ seconds after he jumped.