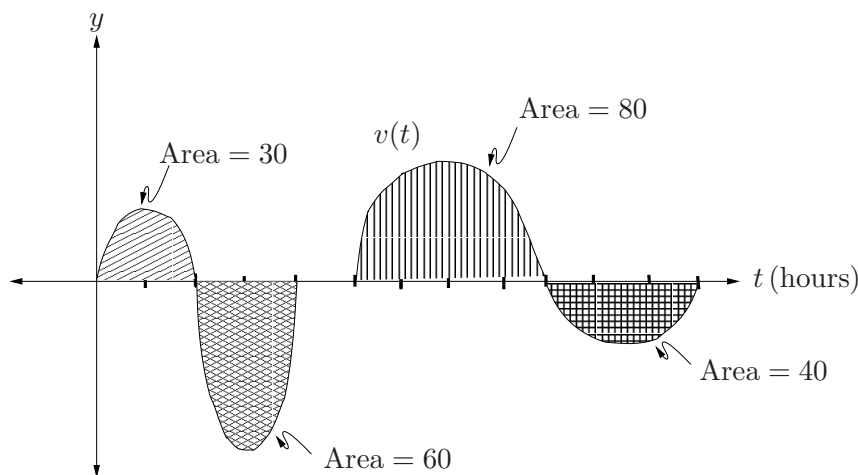


7. (13 points) The following graph gives a taxi driver's velocity (in miles per hour) as a function of time. Assume the driver only travels on a straight road east and west. Positive velocity indicates travel to the east, negative velocity indicates travel to the west. Assume the driver starts his day at the airport at 6 am when $t = 0$, and that the intervals between each tick mark on the horizontal axis correspond to one hour. The area of each shaded region is indicated on the graph.



(a) At approximately what time(s) is the driver's acceleration 0?

The driver's acceleration is 0 when $v'(t) = 0$. This occurs approximately at the times: 7 am, 9 am, 10-11 am, 1 pm, and 4:30 pm

(b) If the taxi driver takes a break at 10 am, how far is he from the airport? Be sure to note whether he is east or west of the airport. Justify your answer appropriately.

The driver will be 30 miles west of the airport. The distance he has travelled is $\int_0^4 v(t) dt$, which is $30 - 60 = -30$. The negative indicates he is west of the airport.

(c) At what time is the driver the furthest from the airport? How far away is he at this time?

One can tell the driver's distance from the airport at time T by evaluating the integral $\int_0^T v(t) dt$. Doing this one sees that the driver is furthest from the airport at 3 pm and he is 50 miles east of the airport.

(d) How many times after 6 am during the day does the driver pass the airport?

Again, looking at the distance the driver is from the airport we look for times when the distance is zero. This will occur sometime between 8 am and 10 am and then again between 11 am and 5 pm. After that his distance from the airport will always be positive to the east. Therefore the driver passes the airport 2 times during the day.