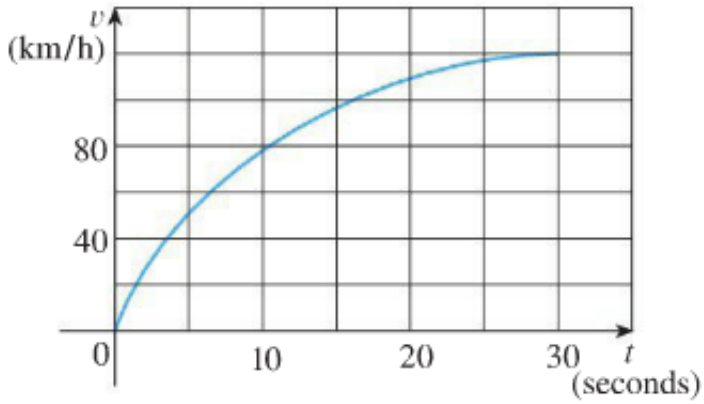
# CAP 2017, HW 5 due February 28

Give complete explanations of what you are doing, written in full sentences. Solutions that have all the correct calculations and computations, but lack explanations, will not get full marks!

1. (5 marks.) The velocity graph of a car accelerating from rest to a speed of 120 km/h over a period of 30 seconds is shown. Estimate the distance travelled during this period.




2. (5 marks.) Suppose $f$ has absolute minimum value $m$ and absolute maximum value $M$. Between what two values must $\int_0^2 f(x)\,dx$ lie? Which property of integrals allows you to make your conclusion?

3. (5 marks.) Suppose that a volcano is erupting and readings of the rate $r(t)$ at which solid materials are spewed into the atmosphere are given in the table. The time $t$ is measured in seconds and the units for $r(t)$ are tonnes (metric tons) per second.

| $t$ | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| $r(t)$ | 2 | 10 | 24 | 36 | 46 | 54 | 60 |

   (a) Give upper and lower estimates for the total quantity $Q(6)$ of erupted materials after $6$ seconds.

   (b) Use the Midpoint Rule to estimate $Q(6)$.

4. (5 marks.) Find a function $f$ and a number $a$ such that, for all $x > 0$

$$6 + \int_a^x \frac{f(t)}{t^2}\,dt = 2\sqrt{x}.$$