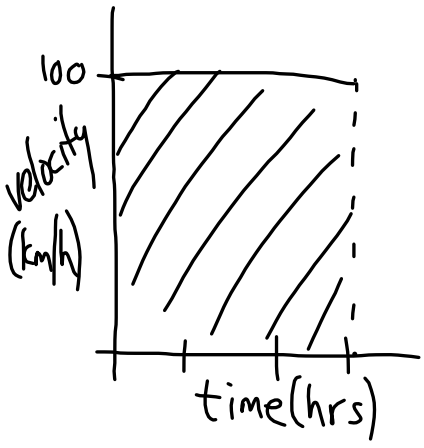
Finding Areas Under Curves

You drive 100 km/h for 3 hrs. Graph this situation.



The shaded area (b/w the curve & the x-axis) represents the distance travelled.

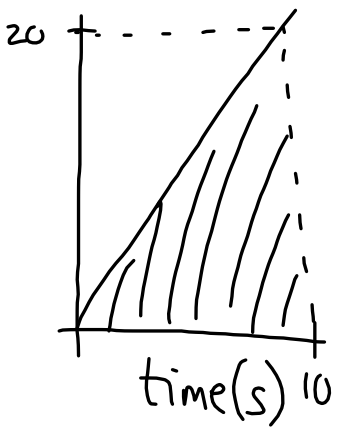
$A = w \times h$

= time x velocity

= distance

You travel $2t$ m/s for 10 seconds.

How far do you go? Graph it.



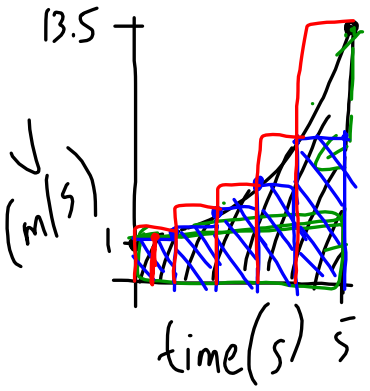
$$A = \frac{1}{2}wh$$

$$= \frac{1}{2}(10)(20)$$

$$= 100\text{m}$$

You travel $\frac{1}{2}t^2+1$ m/s for 5 seconds.

How far will you go? Graph it.



$A = (1)(1)+(1)(1.5)+(1)(3)+(1)(5.5)+(1)(9)$

$=(1)(1+1.5+3+5.5+9)$

w

$= 20$ m

LRAM

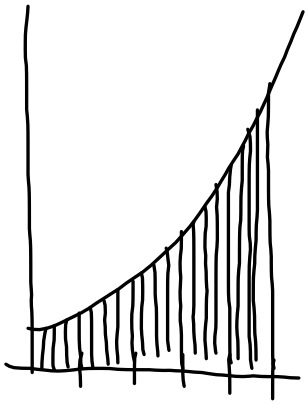
↑ curve hits the left (upper) corner of the rectangle

$A=(1)(1.5+3+5.5+9+13.5)$

$= 32.5$ m

RRAM

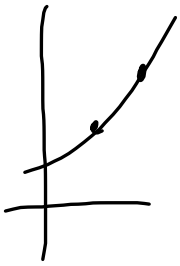
MRAM



If we cut it into ∞ rectangles, of width $\frac{t}{\infty}$, and then add them up, our area would be exact.

$\int$ Sum of ∞ rectangles with 0 width.

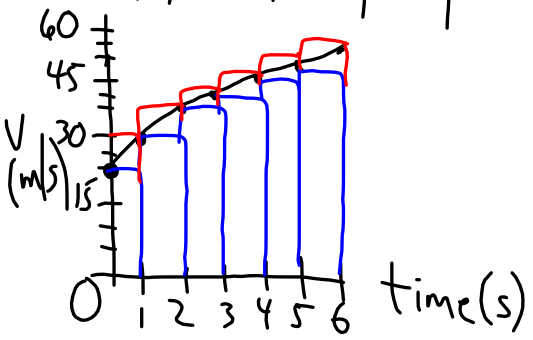
LIMIT



A train travels on a track for 6 sec.

time (sec)	0	1	2	3	4	5	6
velocity (m/s)	20	30	38	44	48	50	55

How far did it go?



Use LRAM & RRAM to estimate.

$A = w(20+30+38+44+48+50)$

$= 1(230) = 230\text{ m}$

$A = 1(30+38+44+48+50+55)$

$= 265\text{ m}$

$\text{Estimate} = \frac{230+265}{2}$

$= 247.5\text{ m}$