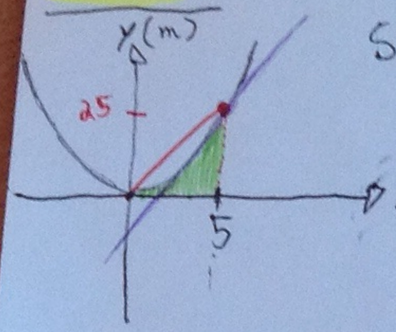
$S(x) = x^2$

$S'(x) = v(x) = 2x$

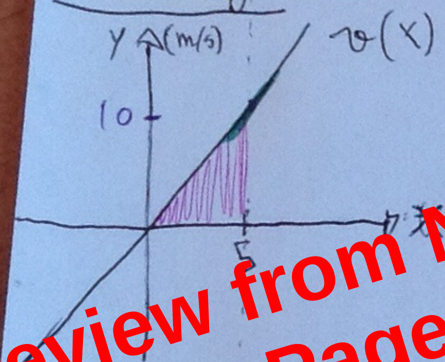
$S''(x) = v'(x) = a(x) = 2$

Position



$S(x) = x^2$

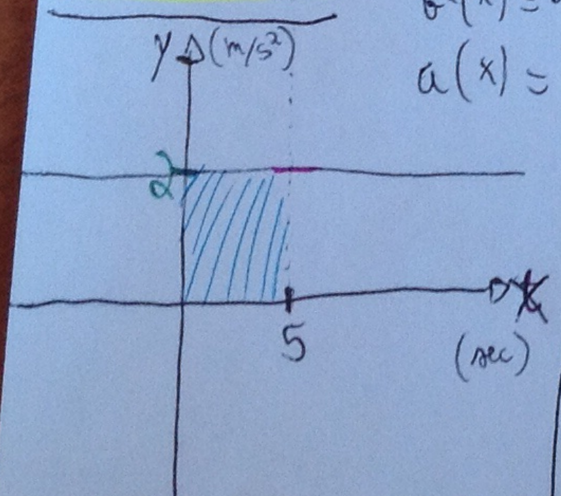
Velocity



$S'(x) = 2x$

$v(x) = 2x$

Acceleration



$v'(x) = 2$

$a(x) = 2$

Derivatives

① $S'(x) = 2x$

$S'(5) = 10$

(slope = 10)

A of triangle = $\frac{5 \cdot 25}{2}$

A of Triangle = 62.5

$v'(x) = 2$

② $v'(5) = 2$

(slope = 2)

③ $a(x) = 2$

$a'(x) = 0$

→ How the acceleration varies

→ slope = 0

Integrals (Area under curve)

$\int 2\,dx = 2x$

Because derivative of $2x = 2$

$\int 2x\,dx = x^2$

because derivative of $x^2 = 2x$

$\int x^2\,dx = \frac{x^3}{3}$

because derivative of $\frac{x^3}{3} = \frac{3x^2}{3} = x^2$

Nothing physically concrete

A = ?

$A = \int_0^5 x^2\,dx$

② $A = \frac{5 \cdot 10}{2} = 25$ | $A = \frac{5\,m/s \cdot 10\,s}{2} = 25\,m$

or...

$A = \int_0^5 2x\,dx = \left[x^2\right]_0^5 = (5)^2 - 0^2 = 25$

$P(5) = x^2 = (5)^2 = 25$ → position is 25 m

① $A = 2 \cdot 5 = 10$ | $A = 2\frac{m}{s^2} \cdot 5s = 10\frac{m}{s}$

or...

$A = \int_0^5 2\,dx = \left[2x\right]_0^5$

→ sum of area of rectangles infinitely small on the interval [0, 5]

$= 2(5) - 2(0)$

$= 10$

$v(x) = 2x$

$v(5) = 2(5) = 10$ → speed after 5s is 10 m/s