Integration.

Anti-derivative.

Find $\frac{dy}{dx}$ when

(i) $y = x^2 - 3x + 1$

Multiply by power and reduce power by 1.

$$\frac{dy}{dx} = 2x - 3$$

(ii) $y = x^3 - 6x^2 + 7x + 8$

$$\frac{dy}{dx} = 3x^2 - 12x + 7$$

Find y when

(i) $\frac{dy}{dx} = 2x + 7$

$$y = x^2 + 7x + c$$

c is called the constant of integration.

(ii) $\frac{dy}{dx} = 3x^2 + 7x$

$$y = x^3 + \frac{7x^2}{2} + c$$

Diff = mult reduce by 1

Inte = Increase power by 1 and divide by new power.

$f'(x) = 3x + 1$ find $f(x)$ given $f(1) = 9$.

$$f(x) = \frac{3x^2}{2} + x + c$$

$$f(1) = \frac{3}{2} + 1 + c = 9$$

$$c = \frac{13}{2}$$

$$f(x) = \frac{3x^2}{2} + x + \frac{13}{2}$$

The velocity v of a particle from a fixed point p is given by $v = t^2 - 6t + 3$. Given the initial distance is

7 Form a function for displacement s in terms of time t.

Distance s is a function of time t.

$$s = f(t)$$

Velocity is rate of change of distance with change in time.

$$v = \frac{ds}{dt} = f'(t)$$

$$v = t^2 - 6t + 3$$

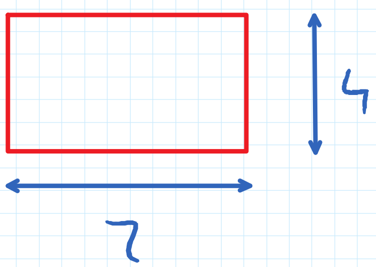
$$s = \frac{t^3}{3} - \frac{6t^2}{2} + 3t + c$$

$t = 0$ $\quad s = 7$

$c = 7$

$$s = \frac{t^3}{3} - 3t^2 + 3t + 7.$$

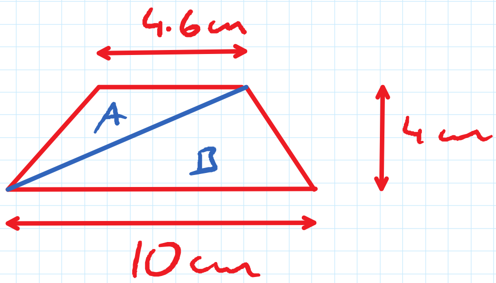
Area.



Find area.

$A = l \times b$

$A = 4 \times 7 = 28$ units sq



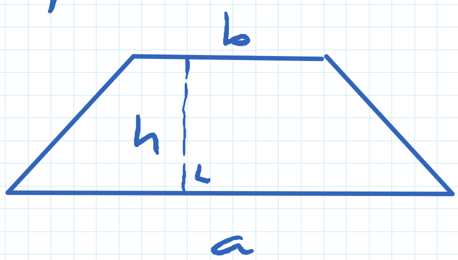
$$\text{Area} = \frac{1}{2}\ \text{base} \times h$$

$$A = \frac{1}{2}(4.6)(4)$$

$$B = \frac{1}{2}(10)(4).$$

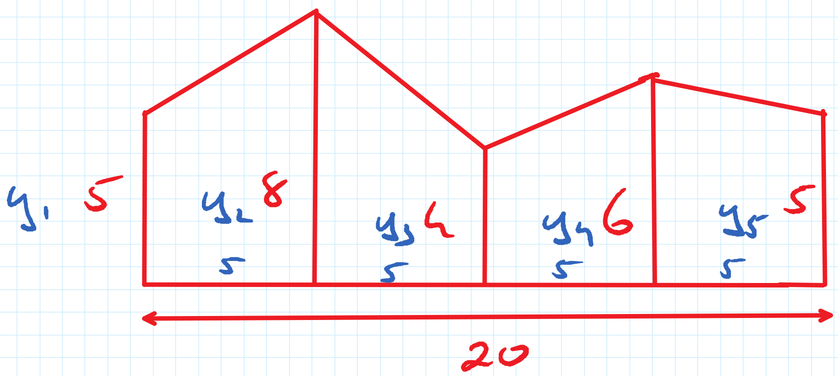
Ans $29.2\ \text{cm}^2$.

Trapezium.



$$A = \left(\frac{a+b}{2}\right)h$$

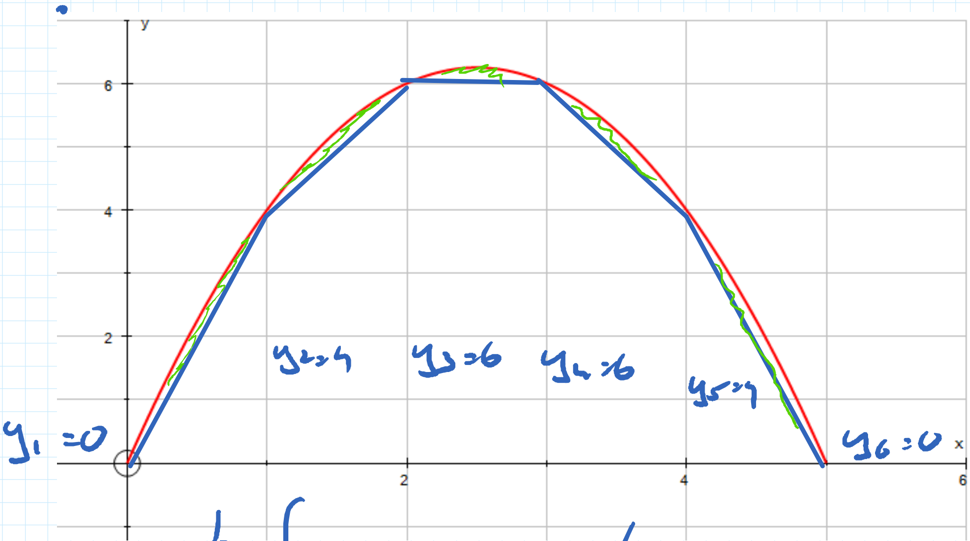
Find area



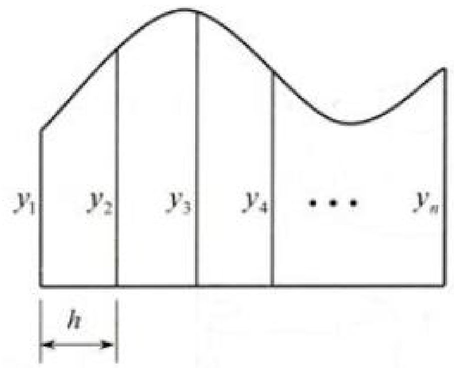
$$\left(\frac{5+8}{2}\right)5 + \left(\frac{8+4}{2}\right)5 + \left(\frac{4+6}{2}\right)5 + \left(\frac{6+5}{2}\right)5$$

$$\frac{5}{2}\left(5+5+2(8+4+6)\right)$$

$$A = \frac{h}{2}\left(y_1+y_5+2(y_2+y_3+y_4)\right)$$

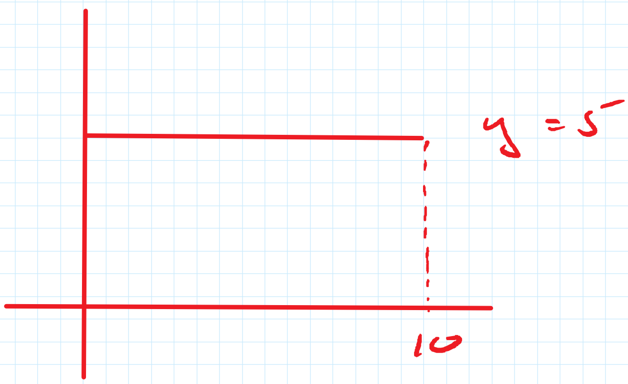


$$\frac{1}{2}\left[y_1 + y_6 + 2(y_2 + y_3 + y_4 + y_5)\right]$$



$$A \approx \frac{h}{2}[y_1 + y_n + 2(y_2 + y_3 + y_4 + \cdots + y_{n-1})]$$

Trapezoidal rule



Find area.

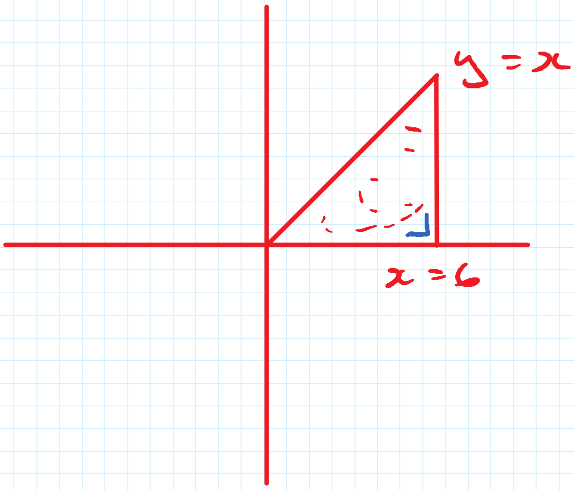
Area $= 5(10)$

$= 50$

$f'(x) = 5$

$f(x) = 5x$

$f(10) = 5(10) = 50$

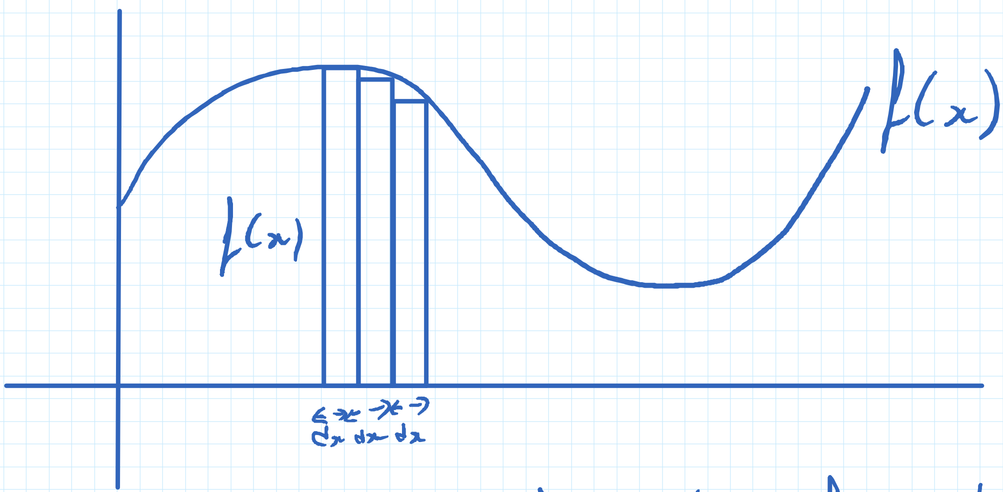


Find area

$$\text{Area} = \frac{1}{2} b h$$
$$= \frac{1}{2}(6)(6)$$
$$= 18 \text{ sq units}$$

$$f'(x) = x$$
$$f(x) = \frac{x^2}{2}$$

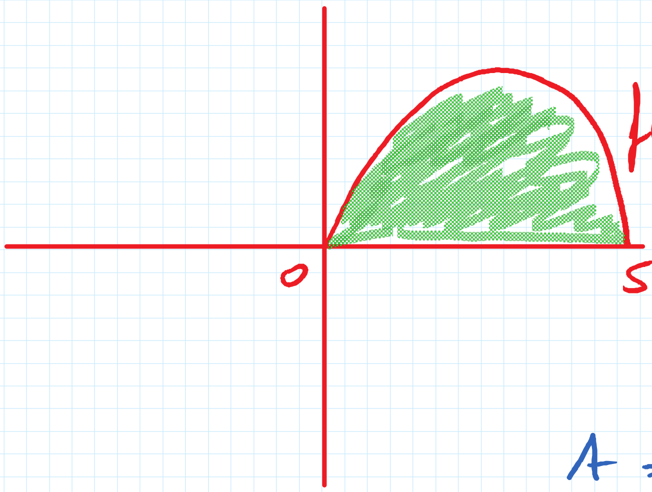
The area under a curve and the x-axis is given by the anti-derivative. Fundamental Principal of Calculus.



$$f(x)\,dx + f(x)\,dx + f(x)\,dx$$

Sum $f(x)\,dx$

$\int f(x)\,dx$ = Integration.



$f(x) = 5x - x^2$. Find shaded area?

$\text{Area} = \int f(x)\,dx$

$$A = \int_0^5 (5x - x^2)\,dx$$

$$\left[\frac{5x^2}{2} - \frac{x^3}{3}\right]_0^5$$

$$\frac{5(5)^2}{2} - \frac{5^3}{3} - \left(\frac{5(0)^2}{2} - \frac{0^3}{3}\right)$$

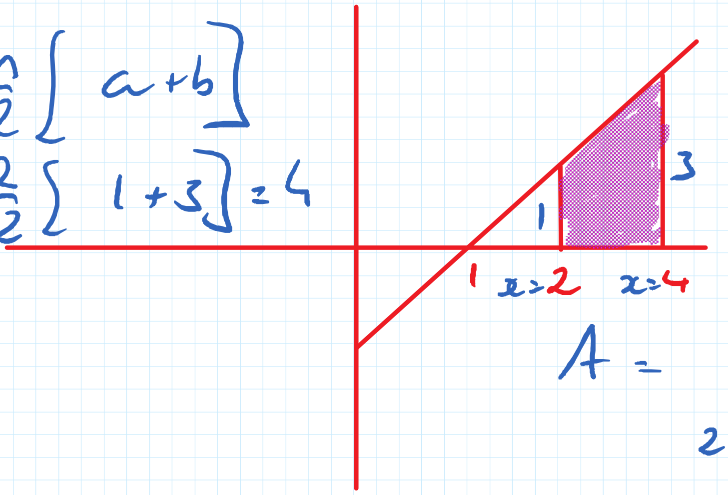
$\frac{125}{6}$ sq units.

$$\int 5\,dx = 5x + c$$

$$\int 5\,dp = 5p + c$$

$$\frac{h}{2}\left[a+b\right]$$

$$\frac{2}{2}\left[1+3\right] = 4$$



$y = x - 1$

Find area.

$$A = \int_2^4 (x-1)\,dx$$

$$\left[\frac{x^2}{2} - x\right]_2^4$$

$$\frac{4^2}{2} - 4 - \left(\frac{2^2}{2} - 2\right) = 4 \text{ sq units}$$