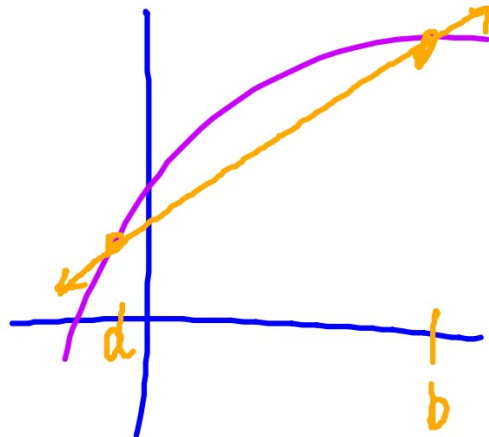


Average rate of change and total distance traveled

Average rate of change = Average velocity

= slope of secant line

$$\frac{f(b) - f(a)}{b - a}$$



Two ways to find average velocity

Find the average velocity on $[0, 3]$
for $f(x) = x^3/3 - 2x$

$$\frac{f(3) - f(0)}{3 - 0}$$
$$\frac{3}{3} = 1$$

$$f'(x) = x^2 - 2$$

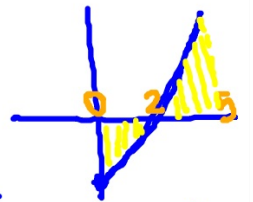
$$\frac{1}{3-0} \int_0^3 (x^2 - 2) dx$$

$$\frac{1}{3} \left(\frac{x^3}{3} - 2x \right) \Big|_0^3 = \frac{f(3) - f(0)}{3 - 0}$$

$$\frac{1}{3} (9 - 6) = 1$$

Two ways to find total distance traveled

Find the total distance traveled on $[0, 5]$ for $f(x) = x^3 - 12x$



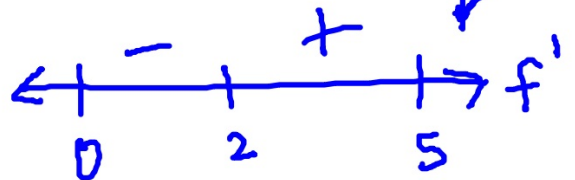
$$f'(x) = 3x^2 - 12$$

$$0 = 3(x^2 - 4)$$

$$x = 2, -2$$

x	f(x)
0	0
2	-16
5	65

16
81
97



$$\int_2^0 (3x^2 - 12) dx + \int_2^5 (3x^2 - 12) dx$$
$$\left[x^3 - 12x \right]_2^0 + \left[x^3 - 12x \right]_2^5$$
$$0 - (8 - 24) + (125 - 60) - (8 - 24)$$
$$16 + 65 + 16$$

(97)

Average value
F. T. C.

2nd F. T. C.

Accum. functions

Average velocity

total distance