Two ways to find average velocity

Find the average velocity on [1,5]
for $f(x)=3x^2 - 2x$

slope between 2 points

$(1, 1)$

$(5, 65)$

$\frac{65-1}{5-1} = \frac{64}{4}$

$= 16$

$f'(x) = 6x - 2$

$\frac{1}{b-a}\int_a^b f'(x)\,dx$

$\frac{1}{5-1}\int_1^5 (6x-2)\,dx$

$\frac{1}{4}\cdot(3x^2-2x)\Big|_1^5$

$\frac{1}{4}\left[(75-10)-(3-2)\right]$

16

$\frac{64}{4}$

Two ways to find total distance traveled

Method 1

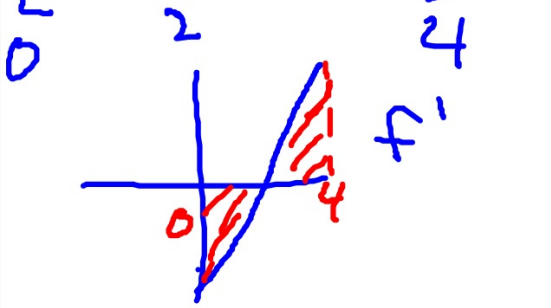
Find the total distance traveled on [0, 4] for $f(x)=3x^2-12x$

need critical numbers

$f'(x)=6x-12$

$0=6x-12$

$2=x$



set up definite integrals

$$-\int_0^2 (6x-12)\,dx + \int_2^4 (6x-12)\,dx$$

$$-(3x^2-12x)\Big|_0^2 + (3x^2-12x)\Big|_2^4$$

$$-(12-24)+(48-48)-(12-24)$$

$$12+12$$

$$\boxed{24}$$

Two ways to find total distance traveled

Method 2

Find the total distance traveled on [0, 4] for $f(x)=3x^2-12x$

find the critical values

Use the position function

$f(0) = 0$

$f(2) = -12$

$f(4) = 0$

12 $\quad |-12-0|$

12 $\quad |-12-0|$

FRQ 2

$t \geq 0$ $(1,0)$

a.) $\int (12t^2 - 36t + 15)\,dt$

$s(t) = 4t^3 - 18t^2 + 15t + C$

$0 = 4 - 18 + 15 + C$

$-1 = C$

$s(t) = 4t^3 - 18t^2 + 15t - 1$

b.) $v(t) = 12t^2 - 36t + 15$

$0 = 3(4t^2 - 12t + 5)$

$0 = 3(2t - 1)(2t - 5)$

At rest: $t = \frac{1}{2}, \frac{5}{2}$

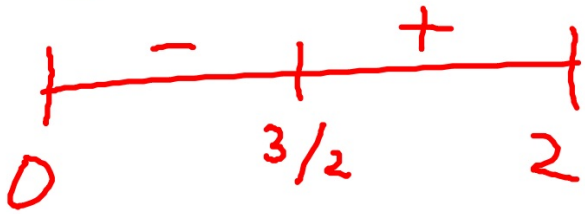
c.) Max. velocity $[0,2]$

$v'(t) = 24t - 36$

$0 = 12(2t - 3)$

$t = 3/2$

t	$v(t)$
0	15
3/2	X
2	-9



Max velocity is 15

$48 - 72 + 15$

$63 - 72$

d.) total distance traveled $[0, 2]$

$s(0) = -1$

$s\left(\frac{1}{2}\right) = 2.5$

$s(2) = -11$

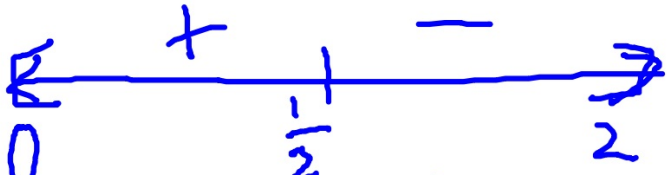
3.5

13.5

17

Method 2

$s(t) = 4t^3 - 18t^2 + 15t - 1$

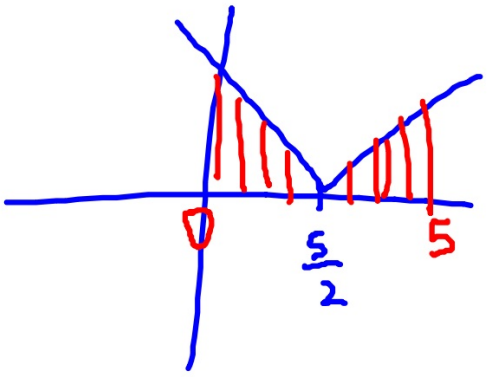


$v(t) = 12t^2 - 36t + 15$

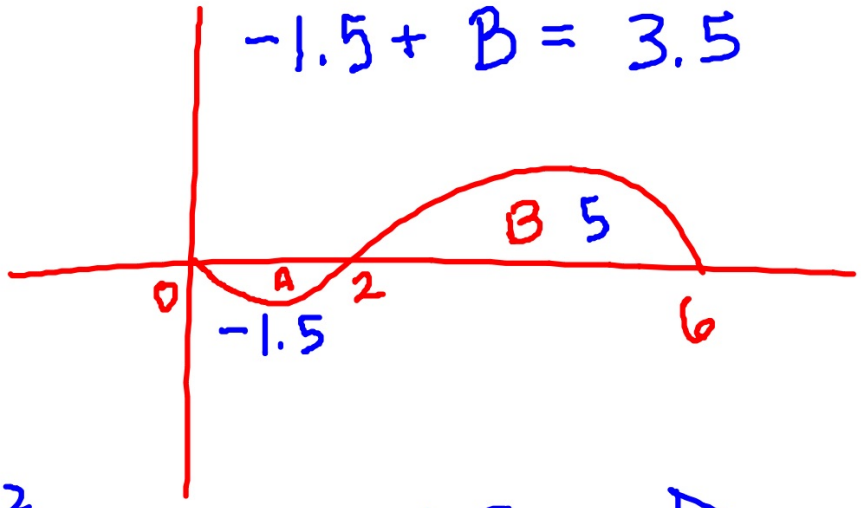
$$\int_0^{1/2} v(t)\,dt - \int_{1/2}^{2} v(t)\,dt$$

$$\int_0^2 |v(t)|\,dt$$

23) $\int_0^5 |2x-5|\,dx$



$-1.5 + B = 3.5$



66

$A = 1.5$

$\int_0^6 f(x)\,dx = 3.5$

$\int_0^2 f(x)\,dx = -1.5$

$\int_0^6 |f(x)|\,dx = 6.5$

$\int_0^6 (2 + f(x))\,dx$

$\int_0^6 2\,dx + \int_0^6 f(x)\,dx$

$12 + 3.5$