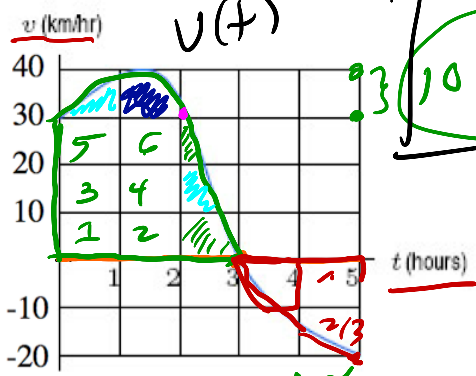
# 5.4 and 5.5:

**Chapter 5, Section 5.4, Question 33**

$6+1+1+\frac{3}{4}$

$8\,{}^{3}/_{4} = \frac{35}{4}$

$\frac{35}{4}\cdot 10 = \frac{350}{4} = \boxed{\frac{175}{2}\text{ Km}}$




$v(t)$

$\boxed{3\ \ 10\text{ units}}$

$1+\frac{2}{3}+\frac{3}{4}$

$=\frac{12+8+9}{12}$

$1\text{ unit} = \frac{29}{12}$

The figure above gives your velocity during a trip starting from home. Positive velocities take you away from home and n[egative velocities take]
you toward home.

Round your answers to the nearest integers.

Where are you at the end of the 5 hours?

$\frac{175}{2} - \frac{145}{6}$

$\frac{29}{12}\cdot 10 = \frac{290}{12}$

$=\frac{145}{6}$

Distance from home is 63 km.

$= \frac{3(175) - 145}{6} = \frac{525-145}{6} = \frac{380}{6} = \frac{190}{3}$

$\approx \boxed{63\,{}^{1}/_{3}}$

When are you farthest from home?

3 hours.

Recall:

FTC $\int_a^b f(x)\,dx = F(b) - F(a)$

where $F'(x) = f(x)$

$\int_a^b \underbrace{F'(x)}_{\text{rate of change}} dx$ or $= \underbrace{F(b) - F(a)}_{\text{difference in } F(x) \text{ between } a \text{ and } b}$

$\int_a^b \underbrace{v(t)}_{\text{rate of change of position}} dt = \underbrace{S(b) - S(a)}_{\text{total displacement}}$

$S(t)$

$v(t) = S'(t)$

$a(t) = v'(t)$

$= S''(t)$

**Chapter 5, Section 5.5, Question 8**

The marginal cost function of producing $q$ mountain bikes is

$$C'(q) = \frac{600}{0.3q+5}.$$

$P'(31) = R'(31) - C'(31) = 210 - \frac{600}{(0.3)31+5} = 210 - \frac{600}{14.3} \approx 168.04$

**(a)** If the fixed cost in producing the bicycles is $2500, find the total cost to produce 30 bicycles.

Enter an answer to two decimal places.

$ 4559.24

$C(30) = C(0) + \int_0^{30} C'(q)\,dq$

$= 2500 + \int_0^{30} \frac{600}{0.3q+5}\,dq$

$\approx 4559.238..$

**(b)** If the bikes are sold for $210 each, what is the profit (or loss) on the first 30 bicycles?

Enter an answer to two decimal places.

$ 1740.76

$P(30) = R(30) - C(30)$

$= 30 \cdot 210 - 4559.24$

$= 6300 - 4559.24$

**(c)** Find the marginal profit on the 31 st bicycle.

Enter an answer to two decimal places.

$ 168.04

$\boxed{R(q) = 210 \cdot q} \Rightarrow R'(q) = 210$

$\underline{q\text{-items}}$: $\underbrace{P(q)}_{\text{profit}} = \underbrace{R(q)}_{\text{revenue}} - \underbrace{C(q)}_{\text{cost}}$

$$\Rightarrow \boxed{\underbrace{P'(q)}_{\substack{\text{marginal}\\ \text{profit}}} = \underbrace{R'(q)}_{\substack{\text{marginal}\\ \text{revenue}}} - \underbrace{C'(q)}_{\substack{\text{marginal}\\ \text{cost}}}} = 0$$

Profit is MAXIMIZED when $P'(q) = 0$ or

$$\underbrace{R'(q) = C'(q)}_{\text{marginal revenue} \,=\, \text{marginal cost}}$$

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$\underline{C'(q)}$: $\int_a^b C'(q)\,dq = C(b) - C(a)$ = cost of producing $b$ items once you are producing $a$ items

or

$$C(b) = C(0) + \underset{\substack{\| \\ \underbrace{\phantom{xx}}_{C(b)-C(0)}}}{\int_0^b C'(q)\,dq} = \text{cost to produce } b \text{ items}$$