



Calculus AB: section 5.5
(Net or Total Change as the Integral of a Rate)

Example 1

At 7 am, water begins leaking from a tank at a rate of $2 + 0.25t$ gal/hour (t is the number of hours after 7 am). How much water is lost between 9 and 11 am? 4

$$\int_2^4 (2 + 0.25t) dt$$

$$2t + \frac{1}{8}t^2 \Big|_2^4$$

$$2(4) + \frac{1}{8}(4)^2 - \left(2(2) + \frac{1}{8} \cdot 2^2\right)$$

$$8 + 2 - \left(4 + \frac{1}{2}\right)$$

$$10 - 4.5 = 5.5 \text{ liters}$$

Example 2

The rate of snowfall (in/hr) during a 6-hour storm is given by $2 \sin \frac{\pi}{6} t$

$\frac{ds}{dt} = 2 \sin 0.5236t$. How much snow falls during the storm?

$$2 \int_0^6 \sin \frac{\pi}{6} t \quad \int \sin 3t dt$$

$$2 \left(-\frac{6}{\pi} \cos \frac{\pi}{6} t \right) \Big|_0^6 \quad -\frac{1}{3} \cos 3t$$

$$-\frac{12}{\pi} (\cos \pi - \cos 0)$$

$$-\frac{12}{\pi} (-1 - 1) = \frac{24}{\pi} \text{ in of snow}$$

Use calculator to find total distance travelled on $(0, 6)$

$$\int_0^6 |v(t)| dt = 49.\bar{3}$$

Example 4

The marginal cost of producing x computer chips (in units of 1000) is

$$C'(x) = 150x^2 - 3,000x + 17,500 \text{ (dollars per thousand chips).}$$

a) Find the cost of increasing production from 10,000 to 15,000 chips.

$$\int_{10}^{15} 150x^2 - 3000x + 17,500 dx = \$18,750$$

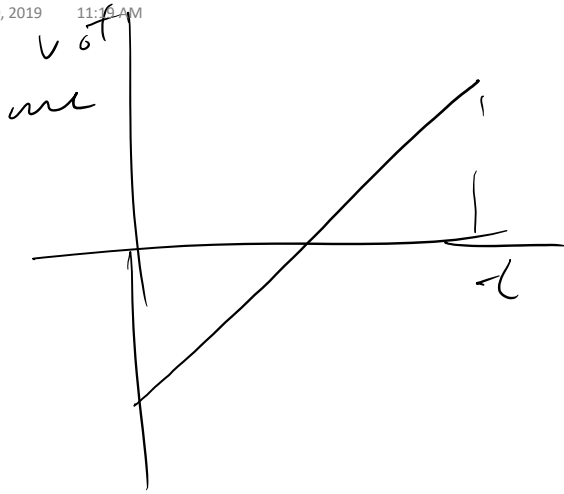
↳

b) Determine the total cost of producing 15,000 chips, assuming that $C(0) = 35,000$ (in other words, it costs \$35,000 to set up the manufacturing run)

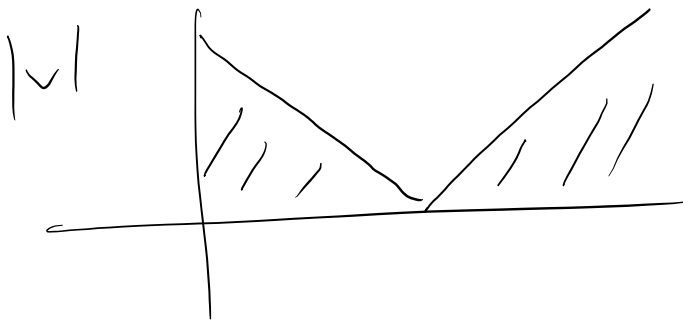
$$\int_0^{15} C'(x) dx + 35,000 = 128,750$$

93,750

342: 6, 7, 11, 12, 16, 20, 21



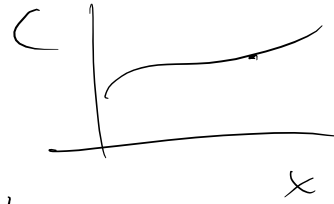
$$\int_0^7 v(t) dt = 0$$



$$\int_0^7 |v(t)| dt = 16'$$

341: 1-4, 13, 19

$$C(x) = \begin{matrix} \text{Total} \\ \text{Cost} \end{matrix}$$



$$\text{marginal cost} \approx C'(x)$$