

Math 1300-005 - Spring 2017

Net Change Theorem - 4/25/17

Guidelines: Please work in groups of two or three. This will not be handed in, but is a study resource for the final exam.

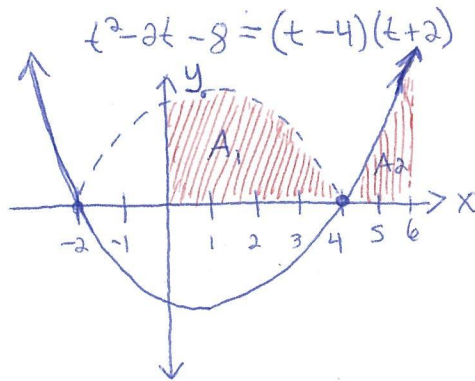
1. The velocity function for a particle moving along a line is

$$v(t) = t^2 - 2t - 8, \quad 0 \leq t \leq 6.$$

- (a) Find the displacement of the particle during the given time interval.

$$\text{Displacement} = \int_0^6 (t^2 - 2t - 8) dt = \left[\frac{1}{3}t^3 - t^2 - 8t \right]_0^6 = \frac{1}{3}(6)^3 - (6)^2 - 8(6) = \boxed{-12}$$

- (b) Find the distance traveled by the particle during the given time interval.



$$\begin{aligned} \text{Distance} &= \int_0^6 |t^2 - 2t - 8| dt \\ &= \underbrace{\int_0^4 (t^2 - 2t - 8) dt}_{A_1} + \underbrace{\int_4^6 (t^2 - 2t - 8) dt}_{A_2} \\ &= -\left(\frac{1}{3}t^3 - t^2 - 8t \right) \Big|_0^4 + \left(\frac{1}{3}t^3 - t^2 - 8t \right) \Big|_4^6 \quad \left[\text{I skipped the arithmetic} \right] \\ &= \frac{80}{3} + \frac{44}{3} = \boxed{\frac{124}{3}} \end{aligned}$$

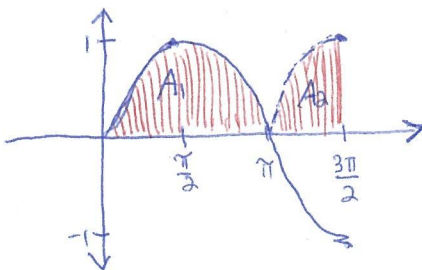
2. The velocity function for a particle moving along a line is

$$v(t) = \sin(t), \quad 0 \leq t \leq \frac{3\pi}{2}.$$

- (a) Find the displacement of the particle during the given time interval.

$$\begin{aligned} \text{Displacement} &= \int_0^{3\pi/2} \sin(t) dt = -\cos(t) \Big|_0^{3\pi/2} = -\cos(3\pi/2) - (-\cos(0)) \\ &= \boxed{1} \end{aligned}$$

- (b) Find the distance traveled by the particle during the given time interval.



$$\begin{aligned} \text{Distance} &= \int_0^{3\pi/2} |\sin(t)| dt \\ &= \underbrace{\int_0^{\pi} \sin(t) dt}_{A_1} + \underbrace{\int_{\pi}^{3\pi/2} \sin(t) dt}_{A_2} \\ &= -\cos(t) \Big|_0^{\pi} - \left(-\cos(t) \Big|_{\pi}^{3\pi/2} \right) \\ &= -\cos(\pi) - (-\cos(0)) - \left(-\cos(3\pi/2) - (-\cos(\pi)) \right) \\ &= -(-1) - (-1) - (0 - (-(-1))) \\ &= 1 + 1 - 1 = \boxed{1} \end{aligned}$$