8.2 Average Value of Function

Standards: MC11 MC11c

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The average value of a function f(x) on the interval [a,b] is:

 $f_{ave} = \frac{1}{b-a} \int_{ave}^{b} f(x) dx$

[Example1] Find the average value of f(x)= 4-x2 m [0,3].

- $f_{\text{AVE}} = \frac{1}{b-a} \int_{a}^{b} f(x) dx = \frac{1}{3-b} \int_{a}^{3} (4-x^{2}) dx = \frac{1}{3} \int_{a}^{3} (4-x^{2}) dx = \frac{1}{3} \left[\frac{4x-x^{3}}{3} \right]_{a}^{3}$
- $=\frac{1}{3}\left[4(3)-\frac{(3)^{3}}{3}-\frac{1}{4(0)}-\frac{(0)^{3}}{3}\right]=\frac{1}{3}\left[12-\frac{27}{3}\right]=\frac{1}{3}\left[12-9\right]=\frac{1}{3}\left[6\right]=3$

(Example 2) Find the average value of f(x) = sin x on [0, Tr].

 $f_{Ave} = \frac{1}{b-a} \int_{T}^{b} f(x) dx = \frac{1}{T-b} \int_{T}^{T} sin T dx = \frac{1}{T} \int_{T}^{T} sin x dx = \frac{1}{T} [cosx]^{T}$

 $= -\frac{1}{\pi} \left[\cos(\pi) \right] - \left[\cos(\alpha) \right] = -\frac{1}{\pi} \left(-\frac{1}{2} \right) - \left(-\frac{1}{2} \right) = -\frac{1}{\pi} \left(-2 \right) = \frac{2}{\pi}$

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