

Some Math for Physics3760

1. Time-averaged values.

Say we have quantity F that varies in time as $F(t)$. By definition time-averaged value of F in time interval from t_1 to t_2 is given by the expression:

$$\langle F \rangle = \frac{1}{T} \int_{t_1}^{t_2} F(t) dt, \text{ where } T = t_2 - t_1. \text{ Note that } \langle F \rangle \text{ and } F(t) \text{ have the same dimension.}$$

Example: $F(t) = 3 + 5t$, $t_1 = 5$, $t_2 = 10$

$$\langle F \rangle = \frac{1}{T} \int_{t_1}^{t_2} F(t) dt = \frac{1}{5} \int_5^{10} (3 + 5t) dt = \frac{1}{5} \int_5^{10} 3 dt + \frac{1}{5} \int_5^{10} 5t dt = \frac{1}{5} \left(3t \Big|_5^{10} + \frac{5}{2} t^2 \Big|_5^{10} \right) = 40.5$$