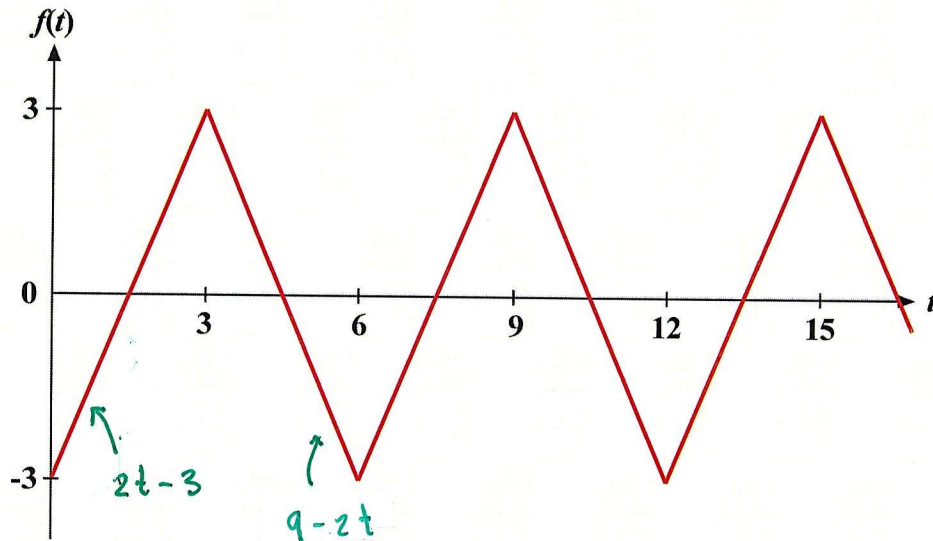


## Homework Problem #017

The red waveform shown below is periodic. Determine its average and effective (rms) values.



$$\begin{aligned}
 F_{\text{ave}} &= \frac{1}{6} \left\{ \int_0^3 (2t-3) dt + \int_3^6 (9-2t) dt \right\} \\
 &= \frac{1}{6} \left\{ [t^2 - 3t]_0^3 + [9t - t^2]_3^6 \right\} \\
 &= \frac{1}{6} \left\{ [9 - 9] + [(54 - 36) - (27 - 9)] \right\} \\
 &= \frac{1}{6} \{ 0 + 0 \} \\
 &= 0
 \end{aligned}$$

$$\begin{aligned}
 F_{\text{eff}} &= \sqrt{\frac{1}{6} \left\{ \int_0^3 (2t-3)^2 dt + \int_3^6 (9-2t)^2 dt \right\}} \\
 &= \sqrt{\frac{1}{6} \left\{ \int_0^3 (4t^2 - 12t + 9) dt + \int_3^6 (81 - 36t + 4t^2) dt \right\}} \\
 &= \sqrt{\frac{1}{6} \left\{ \left[ \frac{4}{3}t^3 - 6t^2 + 9t \right]_0^3 + \left[ 81t - 18t^2 + \frac{4}{3}t^3 \right]_3^6 \right\}} \\
 &= \sqrt{\frac{1}{6} \left\{ (36 - 54 + 27) - 0 + (486 - 648 + 288) - (243 - 162 + 36) \right\}} \\
 &= \sqrt{\frac{18}{6}} = \sqrt{3} \approx 1.732
 \end{aligned}$$