Power Delivered to a Resistance by a Sinusoidal Source

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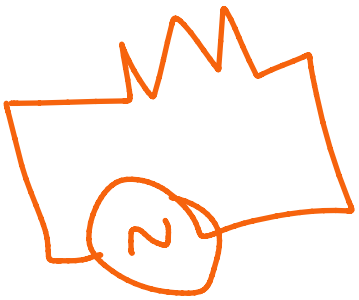

- Suppose that a voltage given by v(t)=100cos(100wt)V is applied to a 50Ω resistance.
- Sketch v(t) to scale versus time.
- Find the rms value of the voltage and the average power delivered to the resistance.
- Find the power as a function of time and sketch to scale

v(t)=100cos(100wt)V

R=50 Ohm

1. RMS value of Voltage (Vrms)

Vrms = Vm/root(2)

= 100/root(2) = 100/1.414 = 70.7 V

2. Pavg = Vrms^2/R = 70.7^2/50 = 100 W

p(t) = v(t)^2/R

= (100cos(100wt))^2/50

= 200 cos^2(100wt)

W= radians per sec

F = Hz

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- Suppose that a sinusoidal voltage is given by

  $v(t) = 150 \cos(200\pi t - 30°)$ V

- Find the angular frequency, the frequency in hertz, the period, the peak value, and the rms value.
- If this voltage is applied to a 50Ω resistance, compute the average power delivered.
- Sketch v(t) to scale versus time

$v(t) = 150 \cos(200\pi t - 30°)$ V

1. Angular Frequency (w) = 200π
2. Frequency in Hz = $w=2\pi f$

$F = w/2\pi = 100\text{Hz}$

3. Period (T) = 1/f = 0.01 sec
4. Peak value (Vm) = 150
5. Rms Value (Vrms) = vm/root(2) = 150/root(2) = 106.0 V
6.
7. Pavg = Vrms^2/R = 106^2/50 = 224.72 W

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$T=4$

$F=1/4 = 0.25$

$W=2 * pi * F = 2*pi*0.25 \text{ rad/sec} = 0.5pi$

$V(t) = \sin(0.5pi\ t)$