

$$1. f = \frac{1}{T}$$

$$a) 1s \quad f = \frac{1}{1s} = 1s^{-1} = 1Hz$$

$$b) 0.2s \quad f = \frac{1}{0.2s} = 5Hz$$

⋮

$$2. T = \frac{1}{f}$$

$$a) 1Hz \Rightarrow T = 1s$$

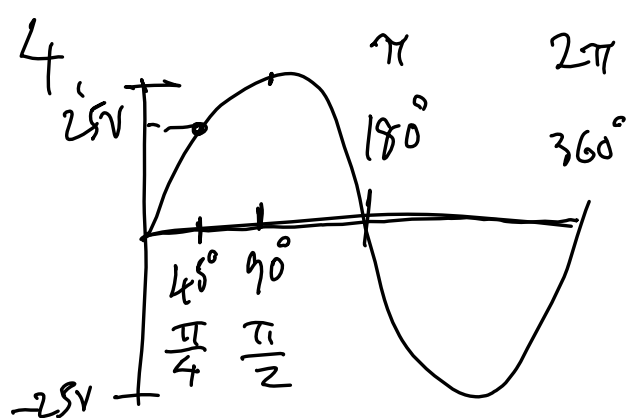
$$b) 60Hz \Rightarrow T = \frac{1}{60Hz} \approx 0.0167s$$

⋮



$$a) V_{pp} = 24V$$

$$b) V_{avg} = \frac{2}{\pi} V_p = 7.64V$$



a) 45°
 b) 90°
 c) 180°
 find V

a) 17.5V b) 25V c) 0V

$$5. \quad 2\pi \text{ rad} = 360^\circ$$

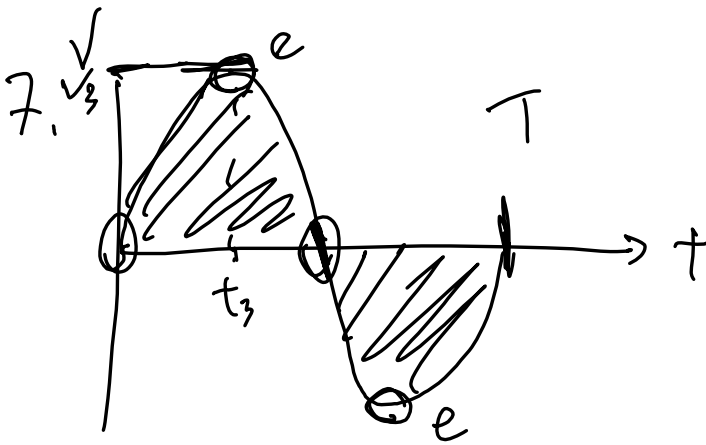
$$\pi \text{ rad} = 180^\circ$$

$$a) \quad 30^\circ \cdot \frac{\pi \text{ rad}}{180^\circ} = \frac{\pi}{6} \text{ rad} = 0.52 \text{ rad}$$

$$b) \quad 45^\circ \cdot \frac{\pi \text{ rad}}{180^\circ} = \frac{\pi}{4} = 0.78 \text{ rad}$$

$$6 \quad a) \quad \frac{\pi}{8} \cdot \frac{180^\circ}{\pi \text{ rad}} = \frac{45^\circ}{2} = 22.5^\circ$$

$$b) \quad \frac{\pi}{2} \cdot \frac{180^\circ}{\pi \text{ rad}} = 90^\circ$$



a) $t_3 = 0.01\text{s} \rightarrow T = 4t_3 = 0.04\text{s}$

b) $t_3 = 0.002\text{s} \rightarrow T = 0.008\text{s}$

$$f = \frac{1}{0.008\text{s}} = 125\text{Hz}$$

c) v_3

d) 0V

e) shown above

f) $v(t) = v \cdot \sin(t)$

$$\frac{dv(t)}{dt} = v \cdot \cos(t)$$

$$\arg\max_t |\cos(t)| = 0, \pi, 2\pi, \dots$$

$$8. Q = VC$$

$$a) \quad i = \frac{dq}{dt} = C \cdot \frac{dv}{dt} \quad i = C \cdot \frac{dv}{dt} \leftarrow \leftarrow$$

$$b) a) X_C \text{ when } V_{DC} \rightarrow \frac{dv}{dt} = 0$$

$$X_C \rightarrow \infty$$

$$i = 0$$

open-circuit

$$b) b) V_{AC} \quad f \rightarrow \infty \Rightarrow \frac{dv}{dt} \rightarrow \infty$$

$$X_C = 0 \quad i \rightarrow \infty$$

short-circuit.

$$c) \quad |X_C| = \frac{1}{\omega C} = \frac{1}{2\pi f \cdot C}$$

if $f \uparrow$, $X_C \downarrow$

$$d) \quad |X_C| = \frac{1}{2\pi \cdot 16\text{kHz} \cdot 4.7\text{nF}} = 33.9\text{k}\Omega$$

9. a)



angle made by an arc equal in length to the radius

b) dimensionless unit

c) velocity of vector around a unit circle



rad/s

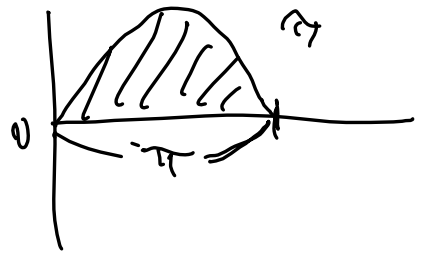
d) ω rotational } frequency
angular

$$e) \omega = 2\pi \cdot f = 2\pi \cdot 60 \text{ Hz} = 377 \frac{\text{rad}}{\text{s}}$$

$$f) \omega = 500 \text{ rad/s}$$

$$f = \frac{\omega}{2\pi} = \frac{500 \text{ rad/s}}{2\pi \text{ rad}} = 79 \text{ Hz}$$

10.



b) half-period

c) $V_{avg} = \frac{2}{\pi} \cdot V_p$ ←

$$V_{avg} = \frac{1}{\pi} \int_0^{\pi} V_p \cdot \sin(t) dt$$

$$= \frac{V_p}{\pi} \left[-\cos(t) \right]_0^{\pi}$$

$$= \frac{V_p}{\pi} \left(\underbrace{-\cos(\pi)}_1 - \underbrace{(-\cos(0))}_1 \right)$$

$$= \frac{2 V_p}{\pi}$$
 ←

11. $Q = CV$

a) $C = \frac{Q}{V} = \frac{50 \mu C}{10 V} = 5 \mu F$

b) $Q = CV = 1 \mu F \cdot 1 kV = 1 \mu C$

c) $V = \frac{Q}{C} = \frac{2 \mu C}{200 \mu F} = 10 V$