INSTITUTE OF INFORMATION TECHNOLOGY

JAHANGIRNAGAR UNIVERSITY

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Course Code : ICT - 3205

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IIT – JU

Answer to the question no – 1

Given that

$$V_1 = 8 \cos\left(50t - \frac{\pi}{3}\right) \text{ Volt}$$

$$V_2 = 15 \cos(50t + 30^\circ) \text{ Volt}$$

$$= 15 \cos\left(50t + \frac{\pi}{6}\right) \text{ Volt}$$

The phasors format of this two signal

$$V_1 = 8 \cos\left(50t - \pi/3\right)$$

$$= 8 \angle -\pi/3$$

$$V_2 = 15 \cos\left(50t + \pi/6\right)$$

$$= 15 \angle \pi/6$$

$$\therefore 8 \angle -\pi/3 = 8 \cos(-\pi/3) + J\ 8 \sin(-\pi/3)$$

$$= 4 + J(-4\sqrt{3})$$

$$15 \angle \pi/6 = 15 \cos \pi/6 + J\ 15 \sin(\pi/6)$$

$$= \frac{15\sqrt{3}}{2} + J\ \frac{15}{2}$$

$$\therefore 8 \angle -\pi/3 + 15 \angle \pi/6 = 4 + (-J4\sqrt{3}) + \frac{15\sqrt{3}}{2} + J\ \frac{15}{2}$$

$$= 17 + J\,0.572$$

$$\text{Modulas} = \sqrt{(17)^2 + (0.572)^2}$$

$$= \sqrt{289.32}$$

$$= 17.0096$$

$$\cong 17$$

$$\text{Argument} = \tan^{-1}\left(\frac{0.572}{17}\right)$$

$$= 1.92^\circ$$

So the resultant Voltage is

$$V = V_1 + V_2$$

$$= 17 \cos(50t + 1.92^\circ)$$

Answer to the question no – 2

The current $i(t) = 6 \sin(2t)$ amp figuring through the circuit Produces.

$$V_R = 6 \sin(2t) V$$

$$V_L = 8 \cos(2t) V$$

The total Voltage $V(t)$ across the current source is

$$V(t) = V_R(t) + V_L(t)$$

$$\Rightarrow V(t) = 6 \sin(2t) + 8 \cos(2t) V$$

written as one sinusoid of frequency $2 rads^{-1}$

In terms of sine function

$$V(t) = 6 \sin(2t) + 8 \cos(2t) = M \sin(2t + \phi)$$

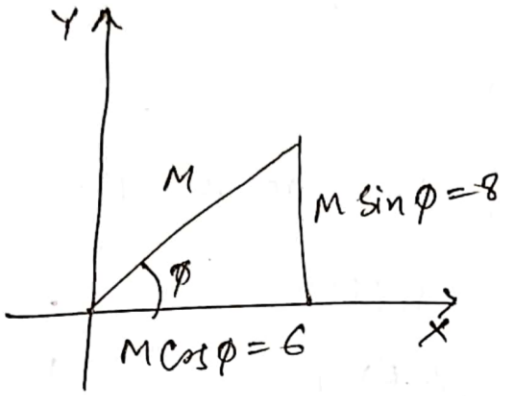
$$\Rightarrow 6 \sin(2t) + 8 \cos(2t) = (M \cos\phi) \sin(2t) + (M \sin\phi) \cos(2t)$$

Comparing both sides

$$M \cos(\phi) = 6$$

$$M \sin(\phi) = 8$$

To determine the magnitude M and Phase ϕ we have to Convert $M\cos(\phi) = 6$ and $M\sin(\phi) = 8$ to polar form,



$M = \sqrt{6^2 + 8^2}$

$= 10$

$\phi = \tan^{-1}(8/6)$

$= 53.13^\circ$

So $v(t) = 6\sin(2t) + 8\cos(2t) = 10\sin(2t + 53.13^\circ)\,v$

The amplitude of the voltage sinusoid is 10 V and angular frequency is $\omega = 2\ rad\,s^{-1}$

Answer to the question no-3

Given that

$$A = 13\angle 35^\circ = 13\left[\cos 35^\circ + j \sin 35^\circ\right]$$
$$= 10.65 + j\,7.46$$

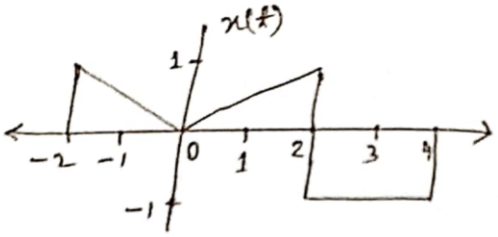
$$B = 30\angle -10^\circ = 30\left[\cos(-10^\circ) + j \sin(-10^\circ)\right]$$
$$= 29.54 - j\,5.21$$

$$A - B = (10.65 - 29.54) + j\,(7.46 + 5.21)$$
$$= -18.89 + j\,12.67$$

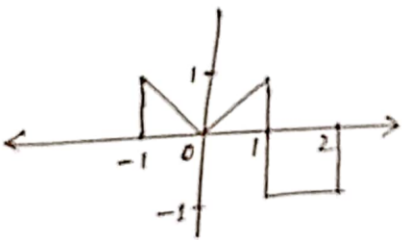
Answer to the question no – 4

Sketch the signal is

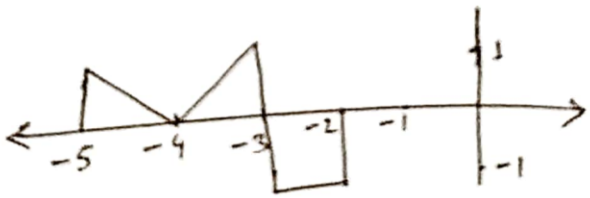
$$y(t) = x(2t+5)$$



$x(2t)$

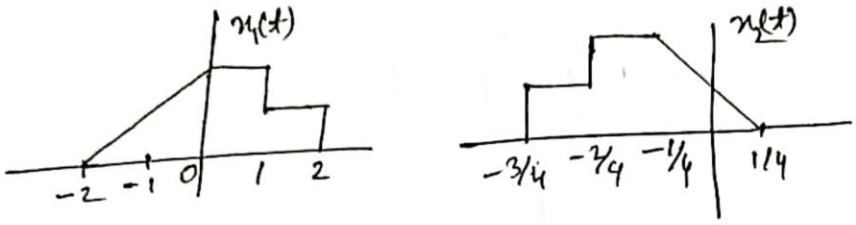


$x(2t+5)$



Answer to the question no – 5

Given the function x_1 and x_2 shown in the figure below express x_2 in terms of x_1.



At first we are seeing that the x_1 is inverted so to invent it we have to shift the x_1 by 2 blocks right side x_1-2.

Then it is inverted $-(x_1-2)$

then the x rooms are shrinked by $4-4(x_1-2)$

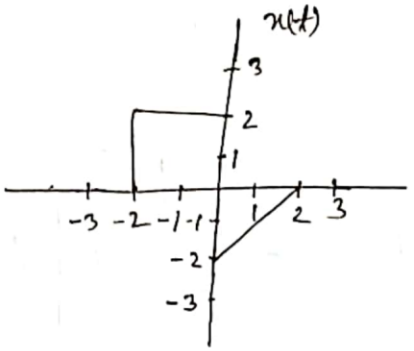
then it is again shifted to one place $-4(x_1$

$+1$

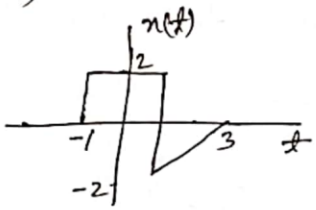
So $x_2 = -4(x_1-2)+1$.

Answer to the question no – 6

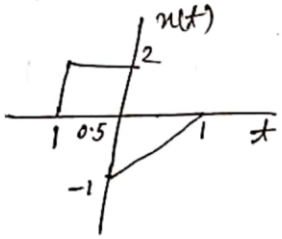
Given figure is



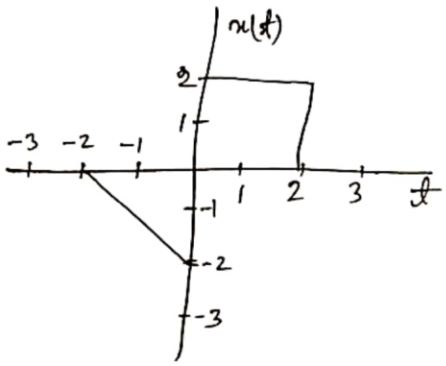
(a) $x(t-1)$



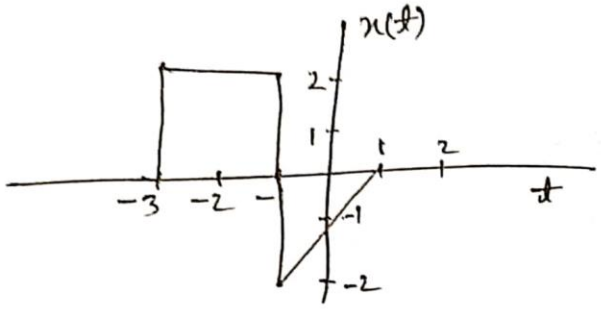
(b) $x(2t)$



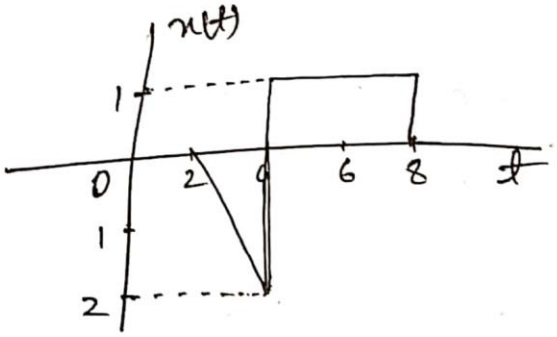
(c) $x(-t)$



(d) $x(2t+1)$



(e) $\frac{1}{4}\, x\left(-\frac{1}{2}t+1\right)-\frac{1}{2}$



Answer to the question no-7

Given that

$$I = 15 \sin(\omega t - \pi/3)$$
$$= 15 \cos(\omega t - 60^\circ - 90^\circ)$$
$$= 15 \cos(\omega t - 150^\circ)$$
$$= 15 \angle -150^\circ$$
$$= 15 [\cos(-150^\circ) + j \sin(-150^\circ)]$$
$$= -13 - j\,7.5$$

Answer to the question no-8

Given that

$$A = 25 \sin(\omega t - \pi/4) \text{ Volt}$$
$$= 25 \cos(\omega t - 45^\circ - 90^\circ) \text{ Volt}$$
$$= 25 \cos(\omega t - 135^\circ) \text{ Volt}$$

$$\Rightarrow A \angle m = 25 \angle -135^\circ$$

And $B = 10 \cos(\omega t + 60^\circ)$ Volt

$$= 10 \angle 60^\circ \text{ Volt}$$

$$\Rightarrow B \angle n = 10 \angle 60^\circ$$

We know.

$$A\angle m * B\angle n = AB\angle m+n$$

$$= 25 \times 10 \angle -135^\circ + 60^\circ$$

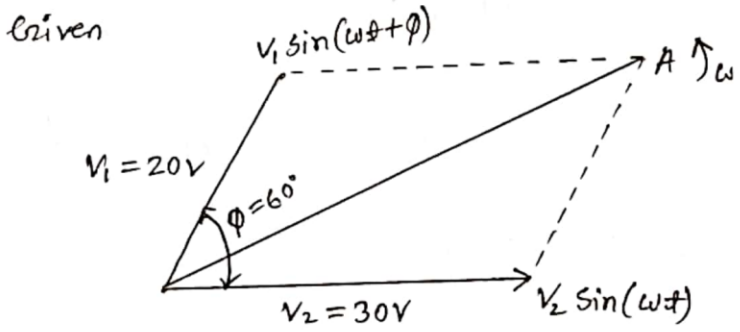
$$= 250 \angle -75^\circ$$

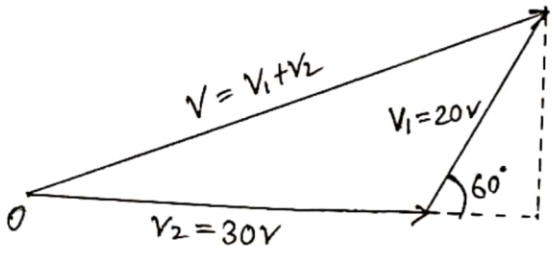
$$= 250\left[\cos(-75^\circ) + j\sin(-75^\circ)\right]$$

$$= 64.7 - j\,241.48$$

Answer to the question no – 9

Given





So the length of the diagonal will be equal to the summation of voltages V_1 and V_2

Voltage V_2 of 30 Volts Points in the refenance direction along the horizontal zero axis so there will be a horizontal component but no Vertical component of V_2.

So, Horizontal component of $V_2 = 30 \cos 0^\circ = 30$ Volts

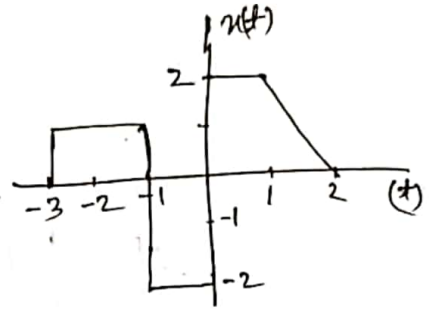
Vertical Component of $V_2 = 30 \sin 0^\circ = 0$ Volts

This gives the rectangular expression for Voltage V_2 and that is $30 + j0$.

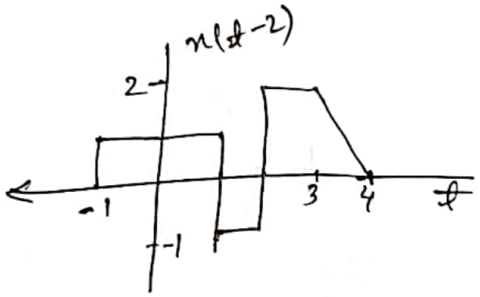
Answer to the question no – 10

a. $y_1(t) = x(t-2)$

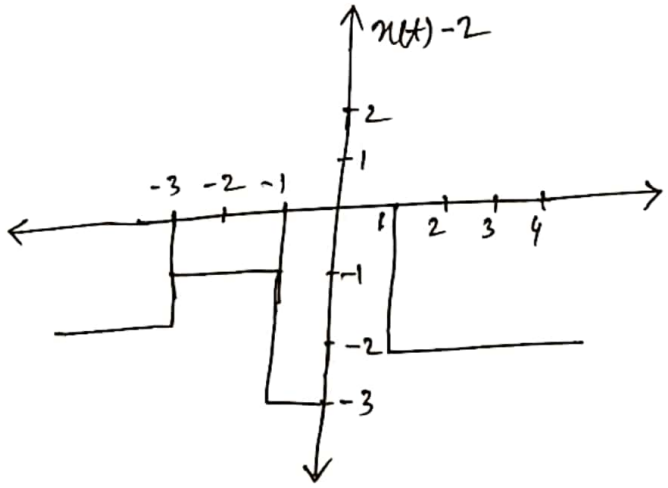
$y_2(t) = x(t)-2$



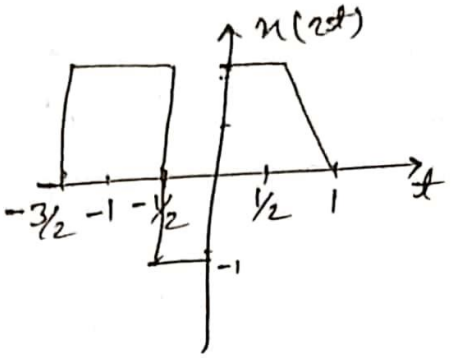
$y_1(t) = x(t-2)$ if means shifting the signal right side by 2



Again $y_2 = x(t)-2$



6. $y_3(t) = x(2t)$ and $y_4(t) = 2x(t)$



$y_4(t) = 2x(t)$