

#Question 1

$x(t) = A$, $-t_1/2 < t < t_1/2$ and zero elsewhere

```
from sympy import *
import sympy as sp
import numpy as np
from numpy import *
A,t,t1,T,n,N = symbols('A,t,t1,T,n,N')
init_printing(pretty_print = True)

Integral (A**2,(t,-t1/2,t1/2))


$$\int_{-t_1/2}^{t_1/2} A^2 dt$$


Energy = integrate(A**2,(t,-t1/2,t1/2))
display('Energy of the signal E1 =', Energy)
E1 = Energy
```

'Energy of the signal E1 ='

$$A^2 t_1$$

```
Power = limit((Integral(A**2,(t,-t1/2,t1/2))/T),T,oo)
display('Power of the signal P1=',Power)
P1 = Power
```

'Power of the signal P1='

$$0$$

```
if E1 == oo and P1 != 0 and P1 != oo:
    display('x(t) is Power Signal')
if P1 == 0 and E1 != 0 and E1 != oo:
    display('x(t) is Energy Signal')
if E1 == oo and P1 != oo and P1 != 0:
    display('x(t) is Neither Energy Nor Power Signal')
if E1 == oo and P1 == oo:
    display('x(t) is Neither Energy Nor Power Signal')
if E1 == 0 and P1 == 0:
    display('x(t) is Neither Energy Nor Power Signal')
```

'x(t) is Energy Signal'

#Question 2

$x(t) = \cos(t)$

```
Integral((sp.cos(t)**2),(t,-oo,oo))
```

$$\int_{-\infty}^{\infty} \cos^2(t) dt$$

```
Energy = integrate((sp.cos(t)**2),(t,-oo,oo))
display('Energy of the signal E2=', Energy)
E2 = Energy
```

```
'Energy of the signal E2='
```

∞

```
Power = limit(integrate((sp.cos(t)**2)/T,(t,-T/2,T/2)),T,oo)
display('Power of the signal P2=',Power)
P2 = Power
```

```
'Power of the signal P2='
```

$1/2$

```
if E2 == oo and P2 != 0 and P2 != oo:
    display('x(t) is Power Signal')
if P2 == 0 and E2 != 0 and E2 != oo:
    display('x(t) is Energy Signal')
if E2 == oo and P2 != oo and P2 == 0:
    display('x(t) is Neither Energy Nor Power Signal')
if E2 == oo and P2 == oo:
    display('x(t) is Neither Energy Nor Power Signal')
if E2 == 0 and P2 == 0:
    display('x(t) is Neither Energy Nor Power Signal')
```

```
'x(t) is Power Signal'
```

Question 3

$x(n) = (1/4)^n U(n)$

```
Energy = Sum(((1/4)**n)**2,(n,0,oo))
E3 = Energy.evalf()
```

```
display('Energy E3=', E3)
```

```
'Energy E3='
```

1.0

```
Power = Sum(((1/4)**n)**2,(n,0,N))/(2*N)
y = Power.doit()
Power1 = limit(y,N,oo)
P3 = Power1
display('Power P3=', P3)
```

```
'Power P3='
```

0

```

if E3 == oo and P3 != 0 and P3 != oo:
    display('x(t) is Power Signal')
if P3 == 0 and E3 != 0 and E3 != oo:
    display('x(t) is Energy Signal')
if E3 == oo and P3 != oo and P3 == 0:
    display('x(t) is Neither Energy Nor Power Signal')
if E3 == oo and P3 == oo:
    display('x(t) is Neither Energy NP Signal')
if E3 == 0 and P3 == 0:
    display('x(t) is NENP Signal')

```

'x(t) is Energy Signal'

Question 4

$x(t) = t^{-0.5} U((t-2))$

```

x = Integral(((t)**(-1/2))**2,(t,2,oo))
Energy = x
Energy

```

$$\int_2^{\infty} t^{-1.0} dt$$

```

y = integrate(((t)**(-1/2))**2,(t,2,oo))
E4 = y
display('Energy E4=', y)

```

'Energy E4='

∞

```

x1 = (1/T)*Integral(((t)**(-1/2))**2,(t,2,T/2))
x1

```

$$\left(\int_2^{T/2} t^{-1.0} dt \right) / T$$

```

y1 = limit((1/T)*integrate(((t)**(-1/2))**2,(t,2,T/2)),T,oo)
display('Power P4=', y1)
P4 = y1

```

'Power P4='

0

```

if E4 == oo and P4 != 0 and P4 != oo:
    display('x(t) is Power Signal')
if P4 == 0 and E4 != 0 and E4 != oo:
    display('x(t) is Energy Signal')
if E4 == oo and P4 != oo and P4 == 0:
    display('x(t) is Neither Energy Nor Power Signal')
if E4 == oo and P4 == oo:

```

```

    display('x(t) is Neither Energy NP Signal')
if E4 == 0 and P4 == 0:
    display('x(t) is NENP Signal')

```

'x(t) is Neither Energy Nor Power Signal'

Question 5

*# Calculate the energy and power of the following problem.
 # Classify the problem into one of the five categories mentioned*

```

x1 = Integral((-4)**2,(t,0,2))
x2 = Integral((4)**2,(t,2,4))
x3 = Integral((4)**2,(t,4,6))
Energy = x1+x2+x3
Energy

```

$$\int_0^2 16 dt + \int_2^4 16 dt + \int_4^6 16 dt$$

```

y = integrate((-4)**2,(t,0,2)) + integrate((4)**2,(t,2,4)) +
integrate((-4)**2,(t,4,6))
E5 = y
display('Energy E5=',y)

```

'Energy E5='

96

```

y2 = limit((1/T)*integrate((-4)**2,(t,0,2)),T,oo) +
limit((1/T)*integrate((4)**2,(t,2,4)),T,oo) +
    limit((1/T)*integrate((-4)**2,(t,4,6)),T,oo)
display('Power P5=', y2)
P5 = y2

```

'Power P5='

0

```

if E5 == oo and P5 != 0 and P5 != oo:
    display('x(t) is Power Signal')
if P5 == 0 and E5 != 0 and E5 != oo:
    display('x(t) is Energy Signal')
if E5 == oo and P5 != oo and P5 == 0:
    display('x(t) is Neither Energy Nor Power Signal')
if E5 == oo and P5 == oo:
    display('x(t) is Neither Energy NP Signal')
if E5 == 0 and P5 == 0:
    display('x(t) is NENP Signal')

```

'x(t) is Energy Signal'