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**Task\_1**

文本, 信件

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**Task\_2**

**Code:**

N = 11;

n = -N:N;

for k = 1:length(n)

a = (-1)\*i\*pi\*n(k);

f1 = (@(t)(2\*t).\*exp(a\*t));

f2 = (@(t)(-2\*(t-1)).\*exp(a\*t));

f3 = (@(t)(2\*(t-2)).\*exp(a\*t));

Xn(k) = 0.5\*quadgk(f1,0,0.5) + 0.5\*quadgk(f2,0.5,1.5) + 0.5\*quadgk(f3,1.5,2);

x1(k) = conj (x(k));

end

subplot(211)

stem(n,abs(Xn))

title('numerical approaches')

xlabel('n')

ylabel('Xn')

grid on

subplot(212)

stem(n,angle(x))

xlabel('n')

ylabel('angle of Xn')

图表

描述已自动生成

subplot(211)

stem(n,abs(x1))

grid on

subplot(212)

stem(n,angle(x1))

grid on

图表

描述已自动生成

Comment: There is no difference between the two graphs above

**Another codes:**

N = 11;

n = -N:N;

for k = 1:length(n)

if (mod(n(k),2)==1)

Xm(k) = i\*(-1)^((n(k)+1)/2)\*(4/((pi\*n(k))^2));

end

subplot(211)

stem(n,abs(x))

subplot(211)

stem(n,abs(x))

title(' mathematical approaches')

xlabel('n')

ylabel('Xm')

grid on

xlabel('n')

ylabel('angle of Xm')

plot(n,abd(abs(Xm)-abs(Xn)));

图表, 折线图

描述已自动生成

Comment: We can see that the magnitude of the difference between two approaches is 10-16 which is so small that we could ignore it. So, we conclude that the two approaches are same

**Task\_3**

**Code:**

t = linspace(0,10,200);

N = 11;

n = -N:N;

x = 0;

for k=1:length(n)

a=-i\*pi\*n(k);

if (mod(n(k),2)==1) temp = i\*(-1)^((n(k)+1)/2)\*(4/((pi\*n(k))^2))\*exp(a\*t);

x = x + temp;

end

end

plot(t,x)

图表, 折线图

描述已自动生成

**Task\_4**

**Code:**

We could conclude from mathematical approach X=T\*sin(T/2\*w)

freqs = linspace(-4\*pi,4\*pi,100);

T = 1;

FT\_rect = T\*sin(freqs\*T/2)./ (freqs\*T /2);

plot(freqs, FT\_rect)

hold on

T = 0.1;

FT\_rect = T\*sin(freqs\*T/2)./ (freqs\*T /2);

plot(freqs, FT\_rect)

hold on

T = 5;

FT\_rect = T\*sin(freqs\*T/2)./ (freqs\*T /2);

plot(freqs, FT\_rect)

hold on

T = 10;

FT\_rect = T\*sin(freqs\*T/2)./ (freqs\*T /2);

plot(freqs, FT\_rect)

hold on

图表, 直方图

描述已自动生成

Comment: As T gets bigger and bigger,

the function oscillates more and more,

and the highest point gets higher and higher.

**Task\_5**

**Code:**

freqs = linspace(-4\*pi,4\*pi,100);

T =0.1;

for k = 1:length(freqs)

f = (@(t) exp(-i\*freqs (k)\*t));

FT\_rect(k) = quadgk(f,-T/2,T/2);

end

plot(freqs, FT\_rect); hold on T =1;

for k = 1:length(freqs)

f = (@(t) exp(-i\*freqs (k)\*t));

FT\_rect(k) = quadgk(f,-T/2,T/2);

end

plot(freqs, FT\_rect);

hold on T =5;

for k = 1:length(freqs)

f = (@(t) exp(-i\*freqs (k)\*t));

FT\_rect(k) = quadgk(f,-T/2,T/2);

end

plot(freqs, FT\_rect);

hold on T =10;

for k = 1:length(freqs)

f = (@(t) exp(-i\*freqs (k)\*t));

FT\_rect(k) = quadgk(f,-T/2,T/2);

end

plot(freqs, FT\_rect);

hold on

**图表, 直方图

描述已自动生成**

Then freqs = linspace(-4\*pi,4\*pi,100);

T =0.1;

for k = 1:length(freqs)

f = (@(t) exp(-i\*freqs (k)\*t));

FT\_rect(k) = quadgk(f,-T/2,T/2);

FT = T\*sin(freqs\*T/2)./ (freqs\*T /2);

diff=FT\_rect-FT;

end

subplot(411)

plot(freqs,diff)

title('T=0.1')

grid on

freqs = linspace(-4\*pi,4\*pi,100);

T =1;

for k = 1:length(freqs)

f = (@(t) exp(-i\*freqs (k)\*t));

FT\_rect(k) = quadgk(f,-T/2,T/2);

FT = T\*sin(freqs\*T/2)./ (freqs\*T /2);

diff=FT\_rect-FT;

end

subplot(412)

plot(freqs,diff)

title('T=1')

grid on

freqs = linspace(-4\*pi,4\*pi,100);

T =5;

for k = 1:length(freqs)

f = (@(t) exp(-i\*freqs (k)\*t));

FT\_rect(k) = quadgk(f,-T/2,T/2);

FT = T\*sin(freqs\*T/2)./ (freqs\*T /2);

diff=FT\_rect-FT;

end

subplot(413)

plot(freqs,diff)

title('T=5')

freqs = linspace(-4\*pi,4\*pi,100);

T =10;

for k = 1:length(freqs)

f = (@(t) exp(-i\*freqs (k)\*t));

FT\_rect(k) = quadgk(f,-T/2,T/2);

FT = T\*sin(freqs\*T/2)./ (freqs\*T /2);

diff=FT\_rect-FT;

end

subplot(414)

plot(freqs,diff)

title('T=10')

**图形用户界面

描述已自动生成**

We can see that the difference between two ways is very small, the magnitude is 10 - 17 10- 15 . So small that we could ignore it and conclude that the two approaches have the same effects.

**Task\_6**

**Code:**

a = 1;

t = linspace(-1,1,200);

xa = exp(-a\*abs(t));

subplot(311)

plot(t, xa)

a = 10;

t = linspace(-1, 1,200);

xa = exp(-a\*abs(t));

subplot(312)

plot(t, xa)

a = 100;

t = linspace(-1, 1,199);

xa = exp(-a\*abs(t));

subplot(313)

plot(t, xa)

**图片包含 图表

描述已自动生成**

As a become bigger, the x decreases faster,

but when t=0, x has the same number 1.

**Task\_7**

**Code:**

fre = linspace(-100\*pi,100\*pi,100);

a = 1;

T = 1;

for k = 1:length(fre)

f = (@(t)exp(a\*abs(t)).\*exp(-i\*fre(k)\*t));

FT\_rect(k) = quadgk(f,-T/2,T/2);

end

subplot(311)

plot(fre, FT\_rect)

grid on

a = 10;

for k = 1:length(fre)

f = (@(t)exp(a\*abs(t)).\*exp(-i\*fre(k)\*t));

FT\_rect(k) = quadgk(f,-T/2,T/2);

end

subplot(312)

plot(fre, FT\_rect)

grid on

a = 100;

for k = 1:length(fre)

f = (@(t)exp(a\*abs(t)).\*exp(-i\*fre(k)\*t));

FT\_rect(k) = quadgk(f,-T/2,T/2);

end

subplot(313)

plot(fre, FT\_rect)

grid on

**图形用户界面

中度可信度描述已自动生成**

As A increases the graph of X(t) spreads out to the sides,

the peak value of X(t) increases and X(t) becomes more stable.

**Task\_8**

**Code:**

N = 8;

n = -4:3;

for k = 1:length(n)

w = pi\*n(k)\*2;

a = -i\*w /N;

f1 = (@(t)(-pi/4).\*exp(-a\*t));

f2 = (@(t)(pi/4).\*exp(-a\*t));

x(k) = 1/N\*quadgk(f1,-4,-1) + 1/N\*quadgk(f2,0,3);

end

stem(n,abs(x))

图表

描述已自动生成

**Task\_9**

**Code:**

fre=linspace(-2\*pi,2\*pi,200);

n=-2:2;

x=0;

for k=1:length(n)

x=x+exp(-1\*i\*fre\*n(k));

end

plot(fre,x)

图表, 折线图

描述已自动生成

I get the same graph.

**That’s all, thank you!**

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