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Math 362 Fourier Analysis

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Class Prep 6

Section 3.7

Key Concept: For a signal defined on [0, T], we will see that the CT II of is a Fourier transform of the symmetric (even) extensions of of over [0,2T]. We will use MATLAB to compute the CT II transform values, and compare the asymptotic behavior of the Fourier Coefficient magnitudes for and .

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| --- | --- |
| >> LinearSymPlot(2,-1) |  |

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| --- | --- |
| >> LinearTimeFreqCII(2,-1,8)  Coeff\_af0\_for\_f =  -9.7656e-04  Coeffs\_ak\_bk\_for\_f =  -0.0020 -0.6366  -0.0020 -0.3183  -0.0020 -0.2122  -0.0020 -0.1591  -0.0020 -0.1273  -0.0020 -0.1061  -0.0020 -0.0909  -0.0020 -0.0796  Coeff\_a0\_for\_g =  -9.7656e-04  Coeffs\_ak\_bk\_for\_g =  -0.8106 0.0012  0 0  -0.0901 0.0004  0 0  -0.0324 0.0002  0 0  -0.0165 0.0002  0 0 |  |
| >> HatShapeTimeFreqCII(8)  Outputs on next page.  Coeff\_af0\_for\_f =  4.2495  Coeffs\_ak\_bk\_for\_f =  0.2017 -0.3183  -0.0010 -0.1592  0.0215 -0.1061  -0.0010 -0.0796  0.0071 -0.0637  -0.0010 -0.0530  0.0032 -0.0455  -0.0010 -0.0398  Coeff\_a0\_for\_g =  4.2495  Coeffs\_ak\_bk\_for\_g =  -0.4047 0.0006  0.2026 -0.0006  -0.0452 0.0002  0 0  -0.0161 0.0001  0.0225 -0.0002  -0.0084 0.0001  0 0 |  |
| >> JumpTimeFreqCII(2,1,8)  Coeff\_af0\_for\_f =  1.5000  Coeffs\_ak\_bk\_for\_f =  0.0020 0.6366  0 0  0.0020 0.2122  0 0  0.0020 0.1273  0 0  0.0020 0.0909  0 0  Coeff\_a0\_for\_g =  1.5000  Coeffs\_ak\_bk\_for\_g =  0.6366 -0.0010  0 0  -0.2122 0.0010  0 0  0.1273 -0.0010  0 0  -0.0909 0.0010  0 0 |  |

Section 4.1

Key Concepts: In this section, we will learn basic skills with matrix-vector arithmetic. Of particular interests are the vector inner products, matrix inner products, and matrix-vector products.

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| --- | --- |
| >> x=[1,0];  >> y=[0,1];  >> dot(x,y)  ans =  0 |  |
| >> DotVectorPlot(x,y,0,3,-1,2)  inner\_product =  0 |  |
| >> x=[1,3];  >> y=[-2,1];  >> DotVectorPlot(x,y,0,3,-4,4)  inner\_product =  1 |  |
| >> A=[1,2;5,-3];  >> B=[3,4;-7,3];  >> C=A+B  C =  4 6  -2 0 |  |
| >> A=[-2,1;3,0];  >> c=4;  >> B=c\*A  B =  -8 4  12 0 |  |
| >> A=[1,2;5,-3];  >> B=[3,4;-7,3];  >> C=A\*B  C =  -11 10  36 11 |  |
| >> D=B\*A  D =  23 -6  8 -23 |  |
| >> I=eye(2)  I =  1 0  0 1 |  |

|  |  |
| --- | --- |
| >> A=[-2,1;3,0];  >> x=[1;4];  >> b=A\*x  b =  2  3 |  |
| >> b=x(1)\*A(:,1)+x(2)\*A(:,2)  b =  2  3 |  |
| >> A=[1,0,3;2,1,1;0,3,4];  >> x=[2;3;-1];  >> b=x(1)\*A(:,1)+x(2)\*A(:,2)+x(3)\*A(:,3)  b =  -1  6  5 |  |
| >> x=[1;0;-1;2];  >> y=[3;-2;1;4];  >> x\*y'  ans =  3 -2 1 4  0 0 0 0  -3 2 -1 -4  6 -4 2 8 |  |
| >> A=[-2,3;1,4];  >> B=inv(A)  B =  -0.3636 0.2727  0.0909 0.1818 |  |
| >> C=A\*B  C =  1 0  0 1 |  |
| >> D=B\*A  D =  1 0  0 1 |  |
| >> A=[1,1,-1;1,1,1;-2,1,0];  >> inv(A)  ans =  0.1667 0.1667 -0.3333  0.3333 0.3333 0.3333  -0.5000 0.5000 0 |  |
| >> A=[1,1,-1;,1,1,1;-2,1,0];  >> G=inv(A)  G =  0.1667 0.1667 -0.3333  0.3333 0.3333 0.3333  -0.5000 0.5000 0  >> A\*G  ans =  1.0000 0 -0.0000  0 1.0000 -0.0000  0 0 1.0000  >> G\*A  ans =  1.0000 -0.0000 0  0 1.0000 0  0 0 1.0000 |  |
| >> A=[1,1,-1;1,1,1,;-2,1,0];  >> b=[2,6,-5]';  >> G=inv(A)  Computation on next page.  G =  0.1667 0.1667 -0.3333  0.3333 0.3333 0.3333  -0.5000 0.5000 0  >> x=G\*b  x =  3  1  2 |  |
| >> A=[1,2;3,4]  A =  1 2  3 4  >> B=[-1,0;2,1]  B =  -1 0  2 1  >> DotMatrix(A,B)  innerproduct =  9 |  |