
Tema lab05

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Exercitiul 5

```
X = [-pi/2,-pi/6,pi/6,pi/2];
f = @(x)sin(x);
fp = @(x)cos(x);
Y = f(X);
Z = fp(X);
x = linspace(-pi/2,pi/2,100);

% 1)
%a)
y = MetNeville(X,Y,x)
%b)
y = MetNDD(X,Y,x)
%c)
[y,z] = MetHermite(X,Y,Z,x)

% 2)
figure(1);
grid on;

subplot(2,2,1);
plot(x, f(x), 'y', 'LineWidth', 3);
title('sin(x)');

subplot(2,2,2);
plot(x, MetNeville(X,Y,x), 'm', 'LineWidth', 3);
title('Metoda Neville');

subplot(2,2,3);
plot(x, MetNDD(X,Y,x), 'c', 'LineWidth', 3);
title('Metoda Newton cu Diferente Divizate');

subplot(2,2,4);
plot(x, y, 'r', 'LineWidth', 3);
title('Metoda Hermite');

figure(2);
grid on;

subplot(2,2,1);
```

```
plot(x, fp(x), 'y', 'LineWidth', 3);  
title('cos(x)');  
  
subplot(2,2,2);  
plot(x, z, 'm', 'LineWidth', 3);  
title('Metoda Hermite z');  
  
% 3)  
figure(3);  
grid on;  
plot(x, abs(f(x)-y), 'k', 'LineWidth', 3);  
title('Eroarea f(x)- Metoda Hermite');
```

y =

Columns 1 through 7

-1.0000	-1.0018	-1.0023	-1.0015	-0.9994	-0.9960	-0.9914
---------	---------	---------	---------	---------	---------	---------

Columns 8 through 14

-0.9855	-0.9785	-0.9703	-0.9610	-0.9506	-0.9391	-0.9266
---------	---------	---------	---------	---------	---------	---------

Columns 15 through 21

-0.9131	-0.8986	-0.8831	-0.8667	-0.8494	-0.8312	-0.8121
---------	---------	---------	---------	---------	---------	---------

Columns 22 through 28

-0.7923	-0.7716	-0.7502	-0.7280	-0.7052	-0.6816	-0.6574
---------	---------	---------	---------	---------	---------	---------

Columns 29 through 35

-0.6326	-0.6071	-0.5811	-0.5546	-0.5275	-0.5000	-0.4720
---------	---------	---------	---------	---------	---------	---------

Columns 36 through 42

-0.4436	-0.4147	-0.3855	-0.3560	-0.3261	-0.2959	-0.2655
---------	---------	---------	---------	---------	---------	---------

Columns 43 through 49

-0.2348	-0.2039	-0.1728	-0.1416	-0.1103	-0.0788	-0.0473
---------	---------	---------	---------	---------	---------	---------

Columns 50 through 56

-0.0158	0.0158	0.0473	0.0788	0.1103	0.1416	0.1728
---------	--------	--------	--------	--------	--------	--------

Columns 57 through 63

0.2039	0.2348	0.2655	0.2959	0.3261	0.3560	0.3855
--------	--------	--------	--------	--------	--------	--------

Columns 64 through 70

0.4147	0.4436	0.4720	0.5000	0.5275	0.5546	0.5811
--------	--------	--------	--------	--------	--------	--------

Columns 71 through 77

0.6071	0.6326	0.6574	0.6816	0.7052	0.7280	0.7502
--------	--------	--------	--------	--------	--------	--------

Columns 78 through 84

0.7716	0.7923	0.8121	0.8312	0.8494	0.8667	0.8831
--------	--------	--------	--------	--------	--------	--------

Columns 85 through 91

0.8986	0.9131	0.9266	0.9391	0.9506	0.9610	0.9703
--------	--------	--------	--------	--------	--------	--------

Columns 92 through 98

0.9785	0.9855	0.9914	0.9960	0.9994	1.0015	1.0023
--------	--------	--------	--------	--------	--------	--------

Columns 99 through 100

1.0018	1.0000
--------	--------

y =

Columns 1 through 7

-1.0000	-1.0018	-1.0023	-1.0015	-0.9994	-0.9960	-0.9914
---------	---------	---------	---------	---------	---------	---------

Columns 8 through 14

-0.9855	-0.9785	-0.9703	-0.9610	-0.9506	-0.9391	-0.9266
---------	---------	---------	---------	---------	---------	---------

Columns 15 through 21

-0.9131	-0.8986	-0.8831	-0.8667	-0.8494	-0.8312	-0.8121
---------	---------	---------	---------	---------	---------	---------

Columns 22 through 28

-0.7923	-0.7716	-0.7502	-0.7280	-0.7052	-0.6816	-0.6574
---------	---------	---------	---------	---------	---------	---------

Columns 29 through 35

-0.6326	-0.6071	-0.5811	-0.5546	-0.5275	-0.5000	-0.4720
---------	---------	---------	---------	---------	---------	---------

Columns 36 through 42

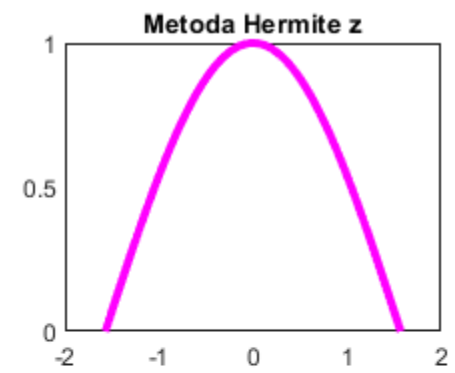
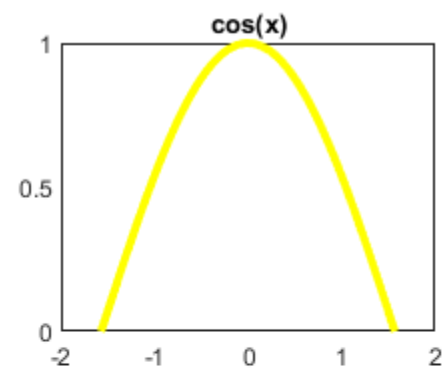
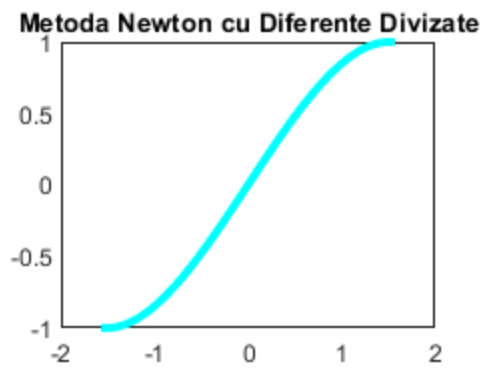
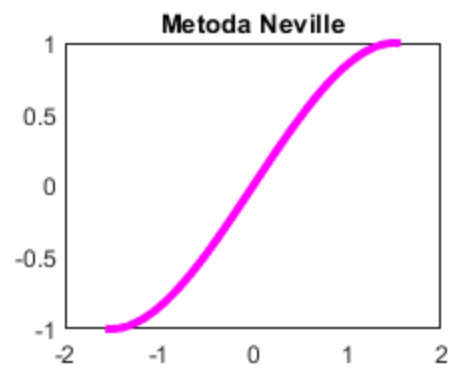
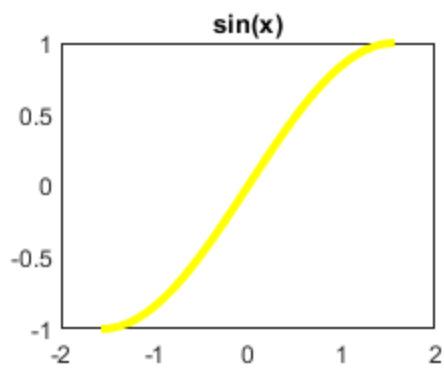
-0.4436	-0.4147	-0.3855	-0.3560	-0.3261	-0.2959	-0.2655
---------	---------	---------	---------	---------	---------	---------

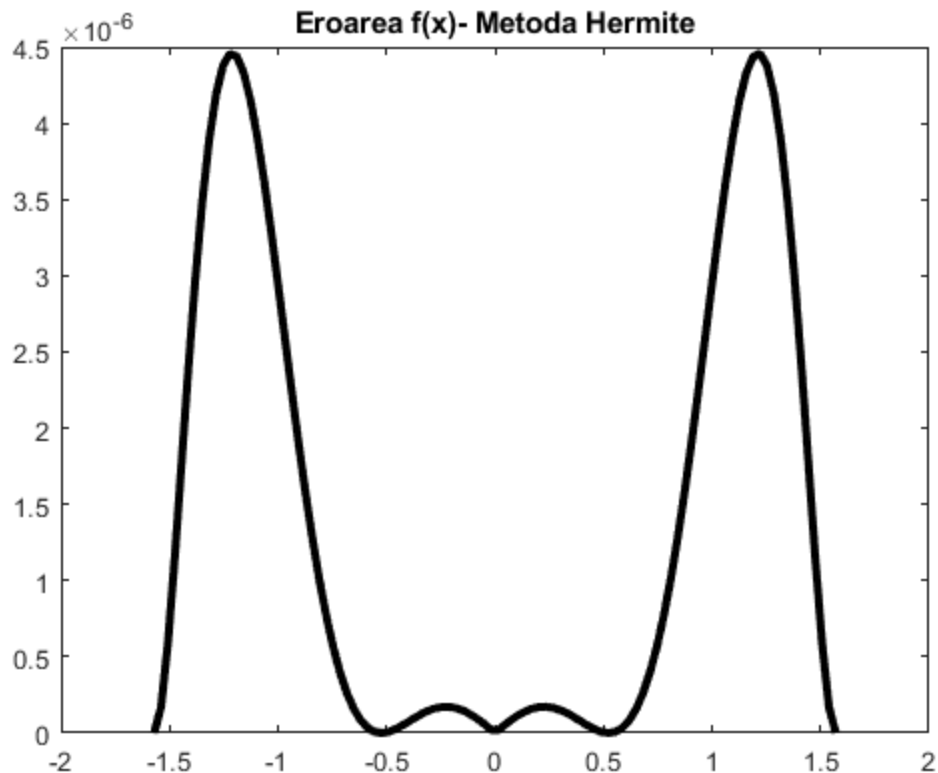
Columns 43 through 49

-0.2348	-0.2039	-0.1728	-0.1416	-0.1103	-0.0788	-0.0473
---------	---------	---------	---------	---------	---------	---------

Columns 50 through 56

-0.0158	0.0158	0.0473	0.0788	0.1103	0.1416	0.1728
Columns 57 through 63						
0.2039	0.2348	0.2655	0.2959	0.3261	0.3560	0.3855
Columns 64 through 70						
0.4147	0.4436	0.4720	0.5000	0.5275	0.5546	0.5811
Columns 71 through 77						
0.6071	0.6326	0.6574	0.6816	0.7052	0.7280	0.7502
Columns 78 through 84						
0.7716	0.7923	0.8121	0.8312	0.8494	0.8667	0.8831
Columns 85 through 91						
0.8986	0.9131	0.9266	0.9391	0.9506	0.9610	0.9703
Columns 92 through 98						
0.9785	0.9855	0.9914	0.9960	0.9994	1.0015	1.0023
Columns 99 through 100						
1.0018	1.0000					





Exercitiul 8

```
f = @(x)sin(x);
fp = @(x)cos(x);
X = [-pi/2,-pi/6,pi/6,pi/2];
Y = f(X);
Z = fp(X);
x = linspace(-pi/2,pi/2,100);

% 1)

[y,z] = MetHermiteDD(X,Y,Z,x);

% 2)
figure(4);
grid on;

subplot(2,2,1);
plot(x, f(x), 'y', 'LineWidth', 3);
title('sin(x)');

subplot(2,2,2);
plot(x, y, 'm', 'LineWidth', 3);
title('Metoda Hermite cu Diferente Divizate');
```

```
figure(5);
grid on;

subplot(2,2,1);
plot(x, fp(x), 'y', 'LineWidth', 3);
title('cos(x)');

subplot(2,2,2);
plot(x, z, 'm', 'LineWidth', 3);
title('Metoda Hermite cu Diferente Divizate z');

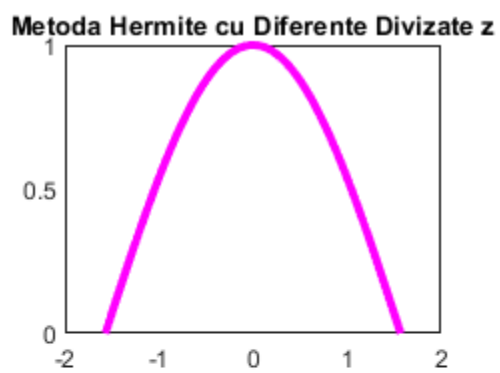
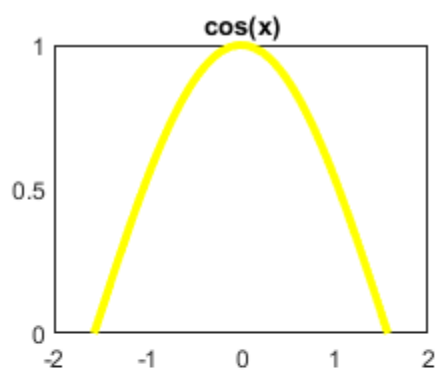
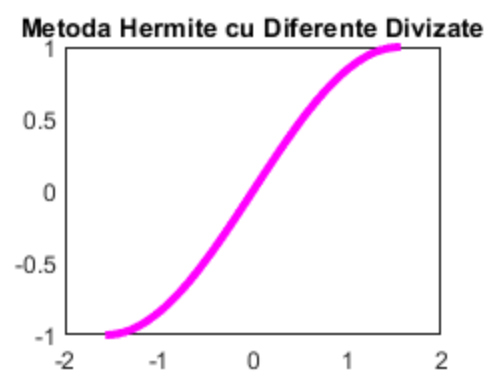
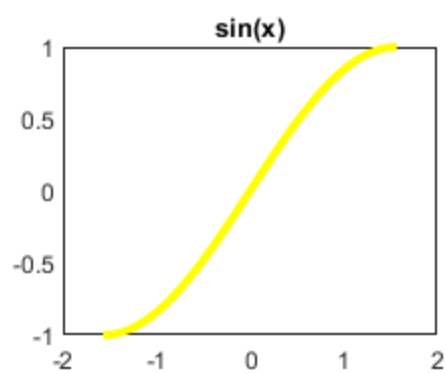
% 3)
figure(6);
grid on;
plot(x, abs(f(x)-y), 'k', 'LineWidth', 3);
title('Eroarea f(x)- Metoda Hermite cu Diferente Divizate');
[y,z] = MetHermiteDD(X,Y,Z,pi/2)

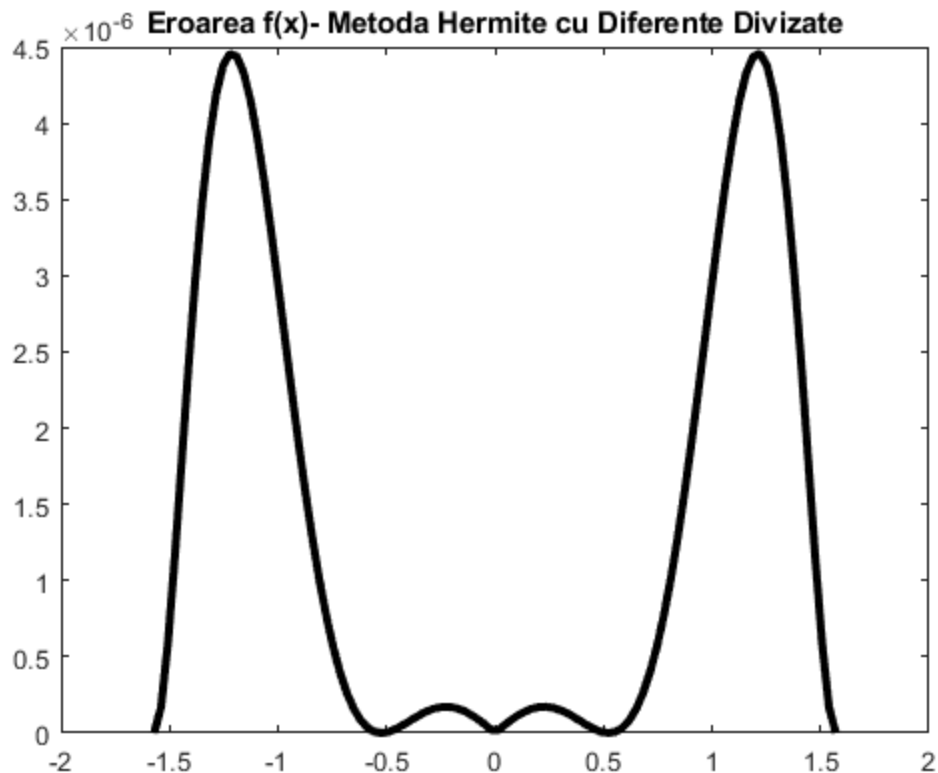
y =

    1.0000

z =

    1.0408e-17
```





Algoritmi functii folosite

```
function [y, z] = MetHermite(X, Y, Z, x)

n = length(X)-1;
Her = 0;
HerD = 0;

for k=1:n+1
    Lpk = zeros(size(x));
    Ld = zeros(size(x));
    L = ones(size(x));
    produs = ones(size(x));
    numitor = ones(size(x));
    asemenea = zeros(size(x));

    for i=1:n+1
        if i~=k
            for m=1:length(x)
                if (x(m)-X(i))~=0
                    produs(m) = produs(m) * (x(m)-X(i));
                else
                    asemenea(m) = 1;
                end
            end
        end
    end
end
```

```
        numitor = numitor .* (X(k)-X(i));
    end
end

for i=1:n+1
    if i~=k
        L = L .* (x-X(i))./(X(k)-X(i));
        Lpk = Lpk + 1./(X(k)-X(i));
        for m=1:length(x)
            if (x(m)-X(i))~=0
                if asemeneea(m)==0
                    Ld(m) = Ld(m) + produs(m)/((x(m)-
X(i))*(numitor(m)));
                end
            else
                Ld(m) = Ld(m) + produs(m)/numitor(m);
            end
        end
    end
end
end

H = L.*L.*(1-2.*Lpk.*(x-X(k)));
K = L.*L.*(x-X(k));
Her = Her + H.*Y(k) + K.*Z(k);
Hd = 2.*L.*Ld.*(1-2.*Lpk.*(x-X(k))) - L.*L.*2.*Lpk;
Kd = 2.*L.*Ld.*(x-X(k)) + L.*L;
HerD = HerD + Hd.*Y(k) + Kd.*Z(k);

end

y = Her;
z = HerD;
end

function [y,z] = MetHermiteDD(X,Y,Z,x)

    n = length(X)-1;

    for i=1:n+1
        XB(2*i-1) = X(i);
        XB(2*i) = X(i);
    end

    Q = zeros(2*n+2);

    for i=1:n+1
        Q(2*i-1,1) = Y(i);
        Q(2*i,1) = Y(i);
        Q(2*i,2) = Z(i);

        if i>=2
            Q(2*i-1,2) = (Q(2*i-1,1) - Q(2*i-2,1)) / (XB(2*i-1) -
XB(2*i-2));
        end
    end
end
```

```
        end
    end

    for i=3:2*n+2
        for j=3:i
            Q(i,j) = (Q(i,j-1) - Q(i-1,j-1)) / (XB(i) - XB(i-j+1));
        end
    end

    for index=1:length(x)
        y(index) = Q(1,1);
        z(index) = 0;

        for k=2:2*n+2
            sumaprod = 0;
            asemenea=0;
            produs = 1;
            produsDiv = 1;

            for m=1:k-1
                produs = produs*(x(index)-XB(m));
                if (x(index)-XB(m))~=0
                    produsDiv = produsDiv*(x(index)-XB(m));
                else
                    asemenea= asemenea + 1;
                end
            end

            for m=1:k-1
                if (x(index)-XB(m)) ~= 0
                    if asemenea==0
                        sumaprod = sumaprod + produsDiv/(x(index)-XB(m));
                    end
                else
                    if asemenea==1
                        sumaprod = sumaprod + produsDiv;
                    end
                end
            end

            z(index) = z(index) + sumaprod*Q(k,k);
            y(index) = y(index) + Q(k,k)*produs;
        end
    end
end

function [y] = MetNDD(X,Y,x)

    n = length(X)-1;
    Q = zeros(n+1);

    for i=1:n+1
        Q(i,1) = Y(i);
    end
```

```
for i=2:n+1
    for j=2:i
        Q(i,j) = (Q(i,j-1) - Q(i-1,j-1)) / (X(i)-X(i-j+1));
    end
end

for index=1:length(x)
    y(index) = Q(1,1);
    for k=2:n+1
        produs = 1;
        for z=1:k-1
            produs = produs*(x(index)-X(z));
        end
        y(index) = y(index) + Q(k,k)*produs;
    end
end

function [y] = MetNeville(X,Y,x)

n = length(X)-1;
Q = zeros(n+1);

for index=1:length(x)
    for i=1:n+1
        Q(i,1) = Y(i);
    end

    for i=2:n+1
        for j=2:i
            Q(i,j) = ((x(index)-X(i-j+1))*Q(i,j-1)-(x(index)-
X(i))*Q(i-1,j-1)) / (X(i) - X(i-j+1)));
        end
    end

    y(index) = Q(n+1,n+1);
end
end

y =

Columns 1 through 7

-1.0000    -0.9995    -0.9980    -0.9955    -0.9920    -0.9874    -0.9819

Columns 8 through 14

-0.9754    -0.9679    -0.9595    -0.9501    -0.9397    -0.9284    -0.9161

Columns 15 through 21

-0.9029    -0.8888    -0.8738    -0.8580    -0.8413    -0.8237    -0.8053
```

Columns 22 through 28

-0.7861 -0.7660 -0.7453 -0.7237 -0.7015 -0.6785 -0.6549

Columns 29 through 35

-0.6306 -0.6056 -0.5801 -0.5539 -0.5272 -0.5000 -0.4723

Columns 36 through 42

-0.4441 -0.4154 -0.3863 -0.3569 -0.3271 -0.2969 -0.2665

Columns 43 through 49

-0.2358 -0.2048 -0.1736 -0.1423 -0.1108 -0.0792 -0.0476

Columns 50 through 56

-0.0159 0.0159 0.0476 0.0792 0.1108 0.1423 0.1736

Columns 57 through 63

0.2048 0.2358 0.2665 0.2969 0.3271 0.3569 0.3863

Columns 64 through 70

0.4154 0.4441 0.4723 0.5000 0.5272 0.5539 0.5801

Columns 71 through 77

0.6056 0.6306 0.6549 0.6785 0.7015 0.7237 0.7453

Columns 78 through 84

0.7660 0.7861 0.8053 0.8237 0.8413 0.8580 0.8738

Columns 85 through 91

0.8888 0.9029 0.9161 0.9284 0.9397 0.9501 0.9595

Columns 92 through 98

0.9679 0.9754 0.9819 0.9874 0.9920 0.9955 0.9980

Columns 99 through 100

0.9995 1.0000

$z =$

Columns 1 through 7

0.0000	0.0317	0.0634	0.0951	0.1266	0.1580	0.1893
Columns 8 through 14						
0.2203	0.2512	0.2817	0.3120	0.3420	0.3717	0.4009
Columns 15 through 21						
0.4298	0.4582	0.4862	0.5137	0.5406	0.5670	0.5929
Columns 22 through 28						
0.6181	0.6428	0.6668	0.6901	0.7127	0.7346	0.7557
Columns 29 through 35						
0.7761	0.7958	0.8146	0.8326	0.8497	0.8660	0.8815
Columns 36 through 42						
0.8960	0.9096	0.9224	0.9341	0.9450	0.9549	0.9638
Columns 43 through 49						
0.9718	0.9788	0.9848	0.9898	0.9938	0.9969	0.9989
Columns 50 through 56						
0.9999	0.9999	0.9989	0.9969	0.9938	0.9898	0.9848
Columns 57 through 63						
0.9788	0.9718	0.9638	0.9549	0.9450	0.9341	0.9224
Columns 64 through 70						
0.9096	0.8960	0.8815	0.8660	0.8497	0.8326	0.8146
Columns 71 through 77						
0.7958	0.7761	0.7557	0.7346	0.7127	0.6901	0.6668
Columns 78 through 84						
0.6428	0.6181	0.5929	0.5670	0.5406	0.5137	0.4862
Columns 85 through 91						
0.4582	0.4298	0.4009	0.3717	0.3420	0.3120	0.2817
Columns 92 through 98						
0.2512	0.2203	0.1893	0.1580	0.1266	0.0951	0.0634

Columns 99 through 100

0.0317 0.0000

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