

Assignment 2

Ex4.26

```
M = [  
    -2, 1, 0;  
    1, -2, 1;  
    0, 1, -1.5  
];  
  
N = InfinityNorm(M);  
disp(N);  
  
M = [  
    4, -1, 0, 1, 0;  
    -1, 4, -1, 0, 1;  
    0, -1, 4, -1, 0;  
    1, 0, -1, 4, -1;  
    0, 1, 0, -1, 4  
];  
  
N = InfinityNorm(M);  
disp(N);  
  
function [ N ] = InfinityNorm( A )  
    N = 0;  
    [m, n] = size(A);  
    for i = 1:m  
        sum = 0;  
        for j = 1:n  
            sum = sum + abs(A(i,j));  
        end;  
        if sum > N  
            N = sum;  
        end;  
    end;  
end
```

Ex6.13

Wind Speed	Electric Power
14	320
22	490
30	540
38	500
46	480

$$f(x) = \frac{(x-22)(x-30)(x-38)(x-46)}{(14-22)(14-30)(14-38)(14-46)}320 + \frac{(x-14)(x-30)(x-38)(x-46)}{(22-14)(22-30)(22-38)(22-46)}490$$

$$\begin{aligned}
& + \frac{(x-14)(x-22)(x-38)(x-46)}{(30-14)(30-22)(30-38)(30-46)} 540 + \frac{(x-14)(x-22)(x-30)(x-46)}{(38-14)(38-22)(38-30)(38-46)} 500 \\
& + \frac{(x-14)(x-22)(x-30)(x-38)}{(46-14)(46-22)(46-30)(46-38)} 480 \\
f(x) &= \frac{(x-22)(x-30)(x-38)(x-46)}{67584} 320 + \frac{(x-14)(x-30)(x-38)(x-46)}{-24576} 490 \\
& + \frac{(x-14)(x-22)(x-38)(x-46)}{16384} 540 + \frac{(x-14)(x-22)(x-30)(x-46)}{-24576} 500 \\
& + \frac{(x-14)(x-22)(x-30)(x-38)}{98304} 480 \\
f(26) &= \frac{(26-22)(26-30)(26-38)(26-46)}{67584} 320 + \frac{(26-14)(26-30)(26-38)(26-46)}{-24576} 490 \\
& + \frac{(26-14)(26-22)(26-38)(26-46)}{16384} 540 + \frac{(26-14)(26-22)(26-30)(26-46)}{-24576} 500 \\
& + \frac{(26-14)(26-22)(26-30)(26-38)}{98304} 480 \\
f(26) &= -\frac{3840}{67584} 320 + \frac{11520}{24576} 490 + \frac{11520}{16384} 540 - \frac{3840}{24576} 500 + \frac{2304}{98304} 480 \\
f(26) &= 524.32W
\end{aligned}$$

Ex8.7

$$\begin{aligned}
f(x_{i+1}) &= f(x_i) + f'(x_i)h + \frac{f''(x_i)}{2!}h^2 + \frac{f'''(x_i)}{3!}h^3 + \frac{f^{(4)}(\xi_1)}{4!}h^4 \\
f(x_{i-1}) &= f(x_i) - f'(x_i)(2h) + \frac{f''(x_i)}{2!}(2h)^2 - \frac{f'''(x_i)}{3!}(2h)^3 + \frac{f^{(4)}(\xi_2)}{4!}(2h)^4 \\
2f(x_{i+1}) + f(x_{i-1}) &= 3f(x_i) + 6\frac{f''(x_i)}{2!}h^2 - 8\frac{f'''(x_i)}{3!}h^3 + \frac{f^{(4)}(\xi_1)}{4!}h^4 + 16\frac{f^{(4)}(\xi_2)}{4!}h^4 \\
f''(x_i) &= 2\frac{f(x_{i-1}) - 3f(x_i) + 2f(x_{i+1}))}{6h^2} + O(h^2)
\end{aligned}$$

Ex8.9

a)

$$\begin{aligned}
f'(x_{i+2}) &= \frac{x_{i+2} - x_{i+1}}{(x_i - x_{i+1})(x_i - x_{i+2})} y_i + \frac{x_{i+2} - x_i}{(x_{i+1} - x_i)(x_{i+1} - x_{i+2})} y_{i+1} + \frac{2x_{i+2} - x_i - x_{i+1}}{(x_{i+2} - x_i)(x_{i+2} - x_{i+1})} y_{i+2} \\
x_i &= 2002, x_{i+1} = 2003, x_{i+2} = 2006 \\
f'(2006) &= \frac{3}{4}y_i - \frac{4}{3}y_{i+1} + \frac{7}{12}y_{i+2} \\
f'_{male}(2006) &= 4940 \\
f'_{female}(2006) &= 10681
\end{aligned}$$

b)

$$f'(x_{i+1}) = \frac{x_{i+1} - x_{i+2}}{(x_i - x_{i+1})(x_i - x_{i+2})}y_i + \frac{2x_{i+1} - x_i - x_{i+2}}{(x_{i+1} - x_i)(x_{i+1} - x_{i+2})}y_{i+1} + \frac{x_{i+1} - x_i}{(x_{i+2} - x_i)(x_{i+2} - x_{i+1})}y_{i+2}$$

$$x_i = 2003, x_{i+1} = 2006, x_{i+2} = 2008$$

$$f'(2006) = -\frac{2}{15}y_i - \frac{1}{6}y_{i+1} + \frac{3}{10}y_{i+2}$$

Predicted Male (2008):

$$4940 = -\frac{2}{15} * 646493 - \frac{1}{6} * 665647 + \frac{3}{10}y$$

$$y = \frac{6062407}{30} * \frac{10}{3} = 673601$$

Predicted Female (2008):

$$10681 = -\frac{2}{15} * 225042 - \frac{1}{6} * 256257 + \frac{3}{10}y$$

$$y = \frac{833961}{10} * \frac{10}{3} = 277987$$

Errors:

$$\frac{|673601 - 677807|}{677807} = 0.0062$$

$$\frac{|277987 - 276417|}{276417} = 0.0057$$