```
f = @(x) sin(x.^2)
```

```
f = function_handle with value:
    @(x)sin(x.^2)
```

```
fp = @(x) 2*x .* cos(x.^2) % Derivata lui f
```

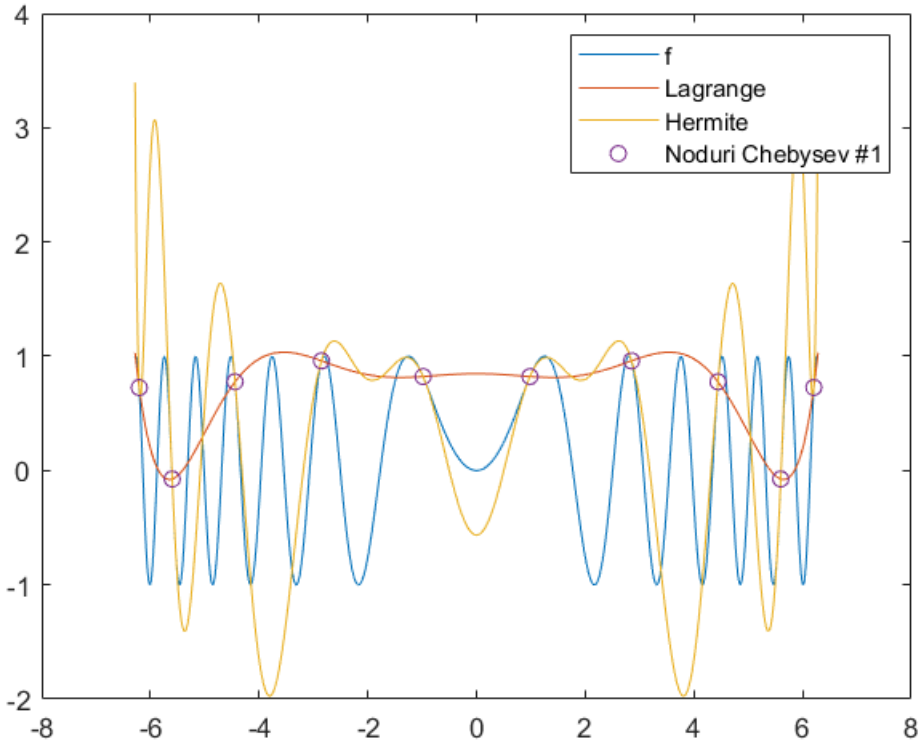
```
fp = function_handle with value:
    @(x)2*x.*cos(x.^2)
```

```
m = 9;
a = -2*pi;
b = 2*pi;
k = 0:m;
x = cos((2*k + 1)*pi/(2*m + 2)) * (b-a)/2 + (a + b)/2; % Noduri Chebysev #1
y = f(x);
yp = fp(x);
```

```
tt = linspace(a, b, 1000);
% L = Lagrange(x, y, tt);
c = barycentricweigths(x);
L = barycentricInterpolation(x, y, tt, c);
```

```
H = Hermite(x, y, yp, tt);
```

```
plot(tt, f(tt), tt, L, tt, H, x, y, 'o');
legend('f', 'Lagrange', 'Hermite', 'Noduri Chebysev #1');
```




Aproximare pentru $f(t), t = \frac{\pi}{5}$

```
t = pi/5;

L_t = Lagrange(x, y, t)
```

```
L_t = 0.8353
```

```
H_t = Hermite(x, y, yp, t)
```

```
H_t = 0.2454
```

```
f_t = f(t)
```

```
f_t = 0.3846
```

Eroarea teoretica

```
% Lagrange
syms x_sym
f_sym = sin(x_sym^2);
fdiff_sym(x_sym) = diff(f_sym, x_sym, m + 1);
LR_m_f = prod(x_sym - x) / factorial(m + 1) * fdiff_sym(x_sym)
```

```
LR_m_f =
```

$$\frac{\left(x_{\text{sym}}+\frac{2213309196611945}{2251799813685248}\right)\left(x_{\text{sym}}+\frac{6303191990716993}{1125899906842624}\right)\left(x_{\text{sym}}-\frac{4426618393223899}{4503599627370496}\right)\left(x_{\text{sym}}-\frac{20072}{70368}\right.}{}$$

```
% In punctul t
LR_val = eval(subs(LR_m_f, x_sym, t))
```

```
LR_val = 1.9937e+03
```

```
% Hermite
HR_m_f = (prod(x_sym - x) .^ 2) / factorial(m + 1) * fdiff_sym(x_sym)
```

```
HR_m_f =
```

$$\frac{\left(x_{\text{sym}}+\frac{2213309196611945}{2251799813685248}\right)^2\left(x_{\text{sym}}+\frac{6303191990716993}{1125899906842624}\right)^2\left(x_{\text{sym}}-\frac{4426618393223899}{4503599627370496}\right)^2\left(x_{\text{sym}}-\frac{200}{703}\right.}{}$$

```
% In punctul t
HR_val = eval(subs(HR_m_f, x_sym, t))
```

```
HR_val = -2.0123e+08
```

Eroarea practica

```
% In aproximarea lui t
err_L_t = abs(L_t - f_t) / f_t
```

```
err_L_t = 1.1717
```

```
err_H_t = abs(H_t - f_t) / f_t
```

```
err_H_t = 0.3620
```

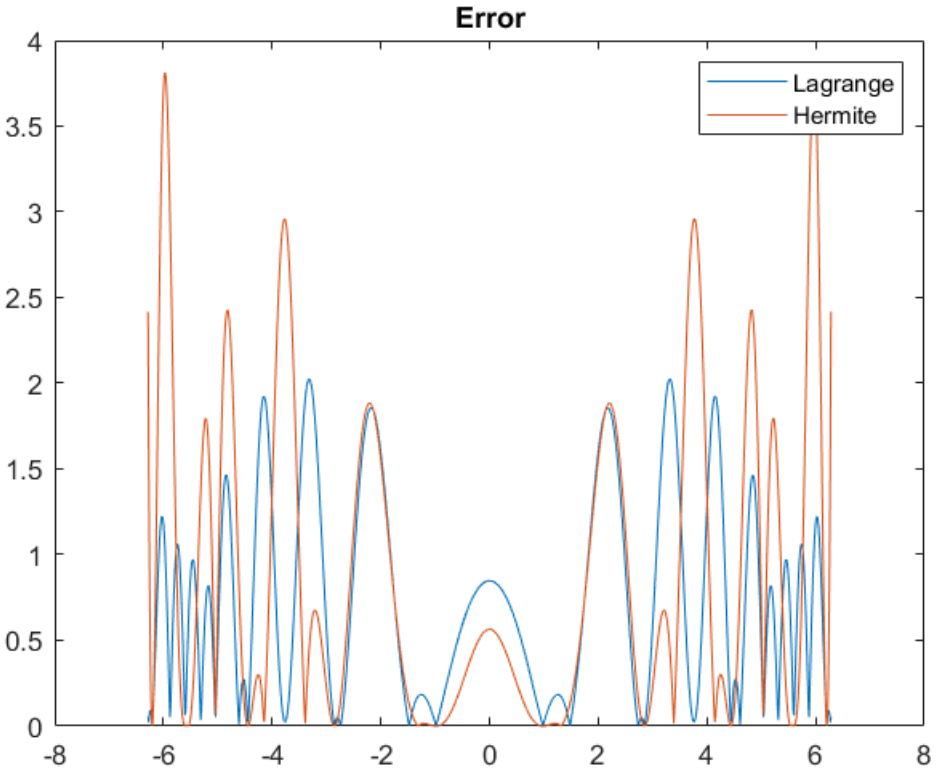
```
% In interpolarea intregii functii
% Lagrange
err_L = abs(f(tt) - L);
fprintf("Lagrange Error Mean: %f, Min: %f, Max: %f", mean(err_L), min(err_L), max(err_L))
```

```
Lagrange Error Mean: 0.749889, Min: 0.002640, Max: 2.024515
```

```
% Hermite
err_H = abs(f(tt) - H);
fprintf("Hermite Error Mean: %f, Min: %f, Max: %f", mean(err_H), min(err_H), max(err_H))
```

```
Hermite Error Mean: 0.891482, Min: 0.000017, Max: 3.812976
```

```
plot(tt, err_L, tt, err_H)
title('Error')
legend('Lagrange', 'Hermite')
```


Error
Lagrange
Hermite
4
3.5
3
2.5
2
1.5
1
0.5
0
-8
-6
-4
-2
0
2
4
6
8