

Notat 1, del 4 (av totalt 9 deler)

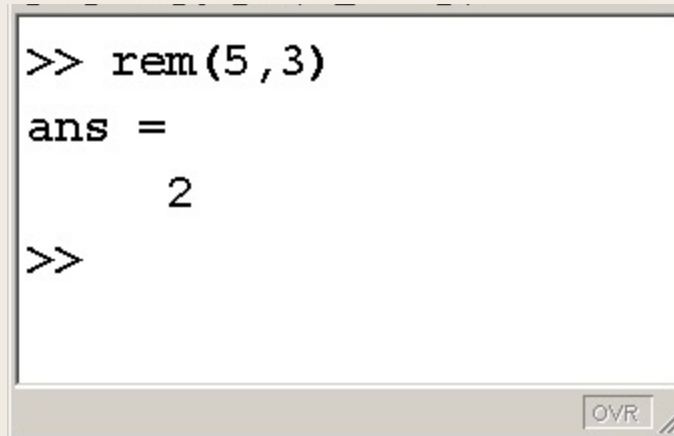
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# Egendefinerte funksjoner

# Funksjoner med flere inn- og utverdier

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- Innverdier kalles også **parametere** eller **inn-argumenter**
- For eksempel:
- **rem**-funksjonen (reminder) har to parameter



```
>> rem(5,3)
ans =
     2
>>
```

A screenshot of a MATLAB command window. The window has a white background and a grey border. The text inside shows the command `>> rem(5,3)` being entered, followed by the output `ans = 2`. The prompt `>>` is shown again on the next line. In the bottom right corner of the window, there is a small button labeled 'OVR' and a standard window control icon.

The image displays the MATLAB environment with three main windows: Workspace, Editor, and Command Window.

**Workspace:** Shows variables `ans`, `x`, and `y`. `x` is a 1x5 vector [1 2 3 4 5] and `y` is a 1x5 vector [5 6 7 8 9]. Both are 1x5 in size. They are circled in red.

**Editor:** Shows the function `g.m` defined as follows:

```
1 function output=g(x,y)
2     % This function multiplies x and y together
3     % x and y must be the same size matrices
4     a = x .*y;
5     output=a;
6
```

**Command Window:** Shows the execution of the function:

```
>> x=1:5;
>> y=5:9;
>> g(x,y)
ans =
     5    12    21    32    45
>>
```

**Command History:** Shows the sequence of commands entered:

```
rem(5,3)
format compact
clc
rem(5,3)
clc
x=1:5;
y=5:9;
g(x,y)
```

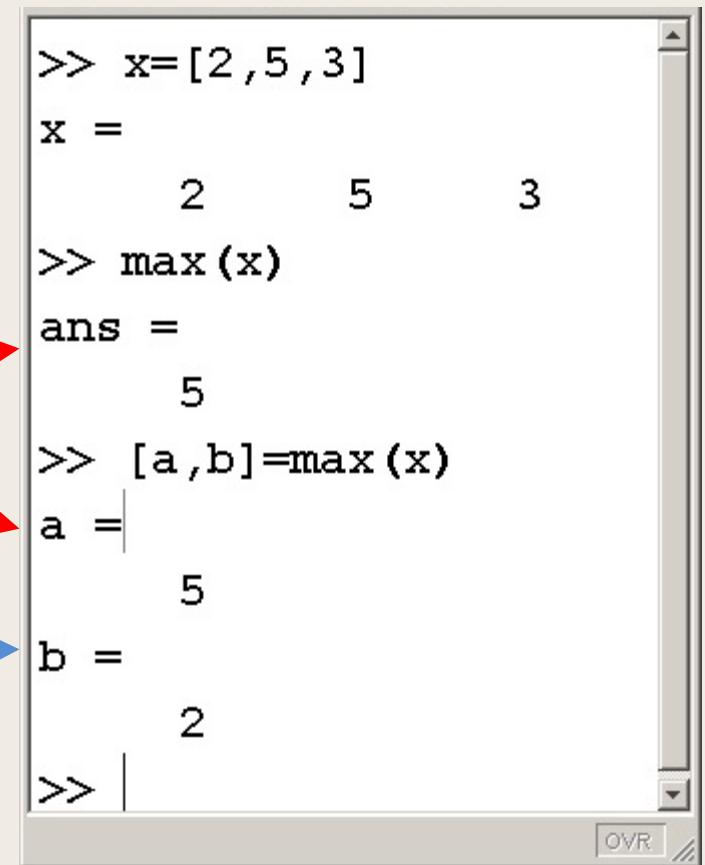
**Yellow Text Box:**

En egendefinert funksjon g med flere innverdier.

Legg merke til at filen heter g.m

# Funksjoner med flere utverdier/utvariabler

- Utverdier kalles også **utargumenter**
- Eksempel:
- **max**-funksjonen kan ha enten 1 eller 2 utverdier, dvs:
  - *selve maksimalverdien*
  - *indeks* hvor maksimalverdien befinner seg i vektoren.



```
>> x=[2,5,3]
x =
     2     5     3
>> max(x)
ans =
     5
>> [a,b]=max(x)
a =
     5
b =
     2
>>
```

The image displays the MATLAB environment with three main windows: Workspace, Editor, and Command Window.

**Workspace:** A table showing the current workspace variables.

Name	Value	Size	Bytes
a	5	1x1	
ans	500	1x1	
d	500	1x1	
v	50	1x1	
x	[1 2 3; 4 5 6]	2x3	
y	[5 6 7 8 9]	1x5	

**Editor - C:\Program Files\MATLAB704\work\motion.m:** A custom function file.

```
1 function [dist, vel, accel] = motion(t)
2 % This function calculates the distance, vel
3 % for a given value of t
4 accel = 0.5 .*t;
5 vel = accel .* t;
6 dist = vel.*t;
```

**Command Window:** Shows the execution of the function.

```
>> motion(10)
ans =
    500
>> [d,v,a]=motion(10)
d =
    500
v =
    50
```

**Command History:** Lists the commands entered in the Command Window.

```
y=5:9;
g(x,y)
clc
x=[1,2,3;4,5,6]
size(x)
clc
motion(10)
[d,v,a]=motion(
```

**Annotations:**

- Egendefinert funksjon med tre utverdier** (Custom function with three outputs) points to the function definition in the Editor.
- Dersom tre utverdier ikke blir definert, blir bare den første tatt med** (If three outputs are not defined, only the first one is taken) points to the Command Window output where only 'ans' is defined for the first call.

# En vektor som utverdi

---

Eksempel:

**size**-funksjonen returnerer bare en utverdi, men denne er en vektor med to elementer

```
>> x=[1,2,3;4,5,6];  
>> size(x)  
ans =  
      2      3  
>>
```

OVR

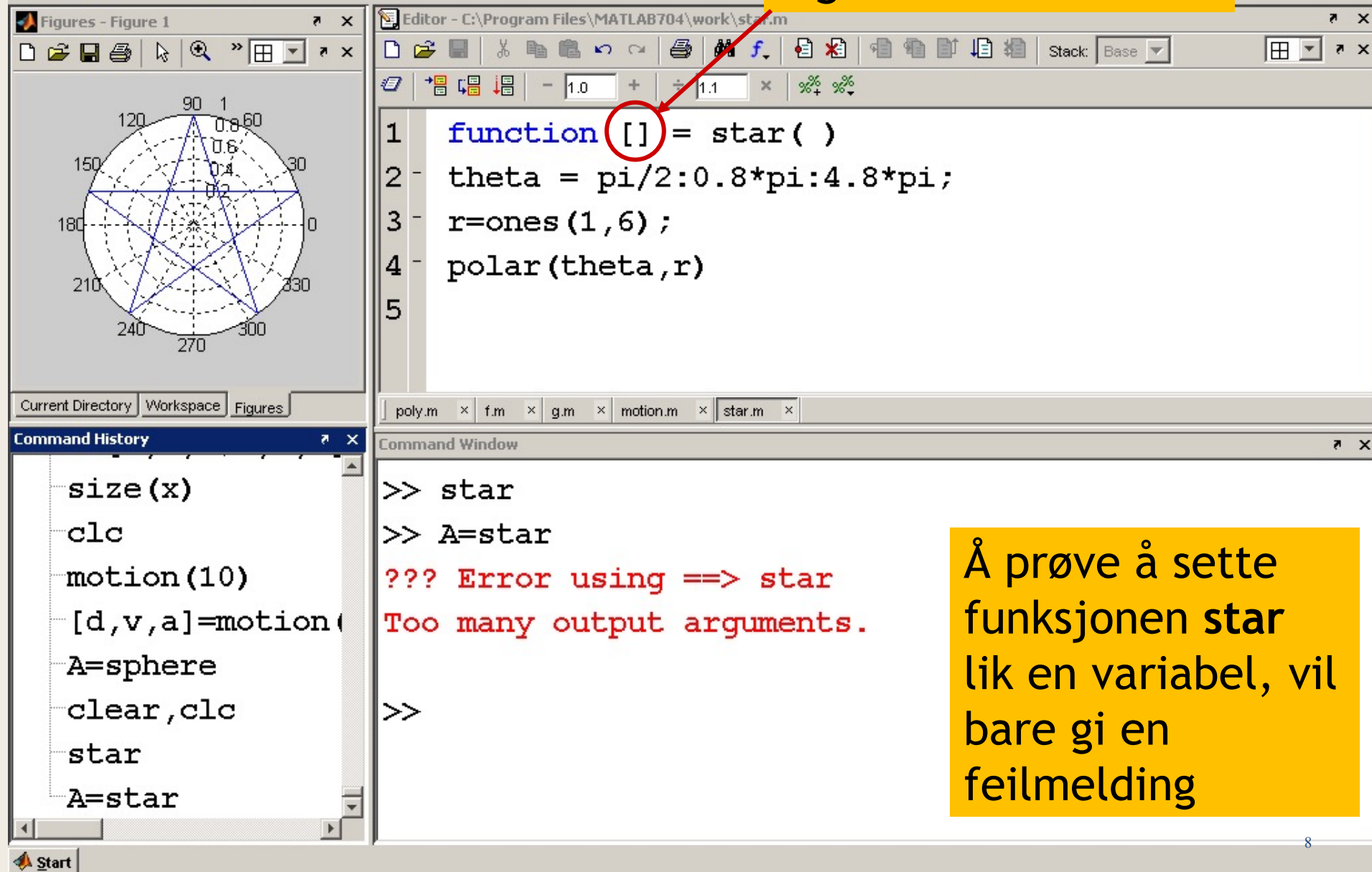
# Funksjoner uten inn- eller utargumenter

---

- Ja, det går an!
- At en funksjon ikke returnerer noe, betyr ikke at den ikke gjør noe.



Ingen utverdi



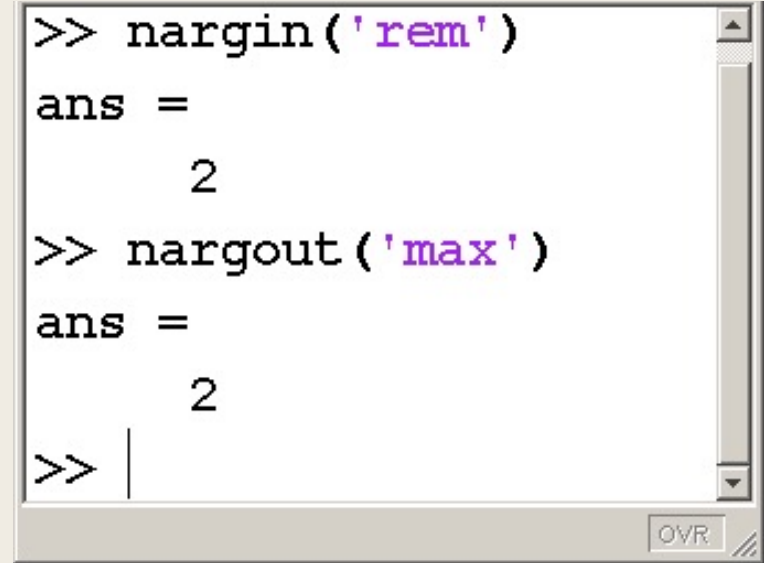
Å prøve å sette funksjonen **star** lik en variabel, vil bare gi en feilmelding



# Antall inn- og utargumenter

---

- Antall parametere/ argumenter
- **nargin**
  - antall innargumenter
- **nargout**
  - antall utargumenter



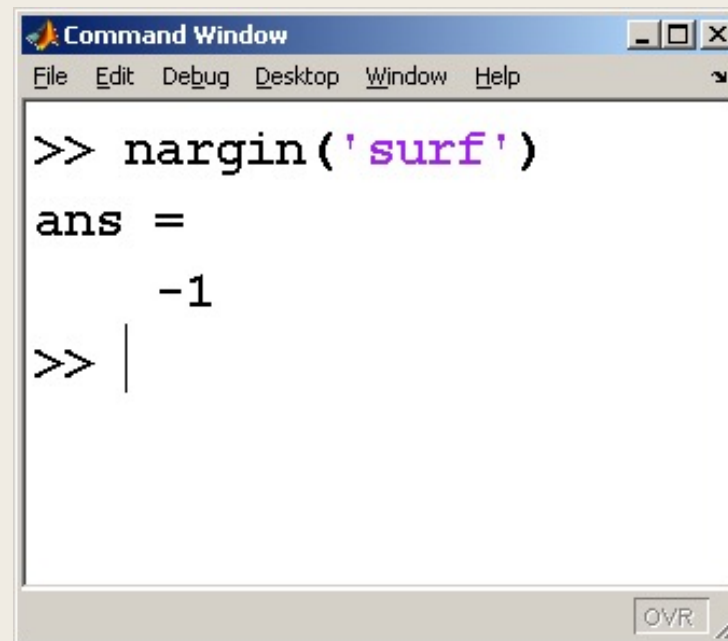
```
>> nargin('rem')
ans =
     2
>> nargout('max')
ans =
     2
>> |
```

The image shows a MATLAB command window with a scroll bar on the right and an 'OVR' button at the bottom right. The window contains the following text:

# Funksjoner med varierende antall argumenter

---

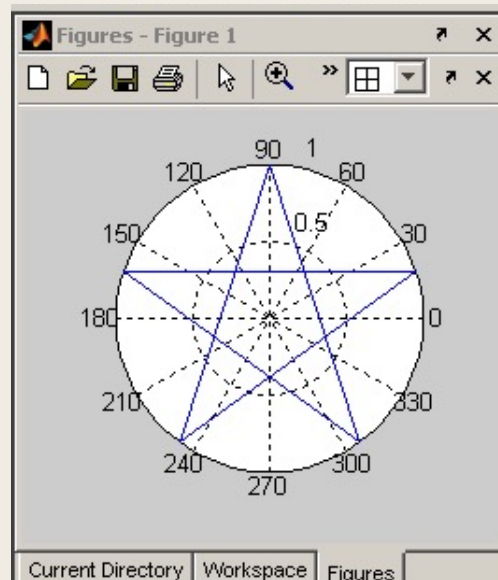
- Eksempel: **surf**-funksjonen
  - **surf(Z)** plotter matrisen Z mot indeksverdier
  - **surf(X,Y,Z)** plotter matrisen Z mot X- og Y-verdier
- **nargin** returnerer -1



```
Command Window
File Edit Debug Desktop Window Help

>> nargin('surf')
ans =
    -1
>> |
```

The image shows a MATLAB Command Window. The title bar says "Command Window". The menu bar includes "File", "Edit", "Debug", "Desktop", "Window", and "Help". The command prompt shows the user entering `>> nargin('surf')`. The output is `ans = -1`. The prompt is now `>> |`. There is an "OVR" button in the bottom right corner of the window.



Command History

```
nargout('max')
clc
nargin('surf')
clc
star1
clc
star1
A=star1
```

Editor - C:\Program Files\MATLAB704\work\star1.m

```
1 function A=star1( )
2 theta = pi/2:0.8*pi:4.8*pi;
3 r=ones(1,6);
4 polar(theta,r)
5 if nargout==1
6     A='Twinkle twinkle little star';
7 end
```

Sjekker om antall  
utargumenter er lik 1

poly.m x f.m x g.m x motion.m

Command Window

```
>> star1
>> A=star1
A =
Twinkle twinkle little star
>>
```

Hvis star1 ikke er satt lik  
noen variabler blir  
stjerna tegnet.

Hvis star1 er satt lik en  
variabel, blir også en streng  
returnert

# Lokale variabler

---

- Variabler definert inni en funksjon har bare betydning inne i den funksjonen  
-> **Lokal variabel**
- Måten man kommuniserer inn og ut av funksjoner på er via **inn- og ut-argumenter**

# Se innholdet av en funksjon

---

- MATLAB har to typer funksjoner
  - *Innebygde*. Her er ikke koden tilgjengelig.
  - *m-filer*. Her kan vi lese innholdet, hvis vi vil.
- Bruk **type**-funksjonen for å se koden i en m-fil

```
>> type sphere
```

```
function [xx,yy,zz] = sphere(varargin)
```

```
%SPHERE Generate sphere.
```

```
% [X,Y,Z] = SPHERE(N) generates three (N+1)-by-(N+1)  
% matrices so that SURF(X,Y,Z) produces a unit sphere.
```

```
%
```

```
% [X,Y,Z] = SPHERE uses N = 20.
```

```
%
```

```
% SPHERE(N) and just SPHERE graph the sphere as a  
% and do not return anything.
```

```
%
```

```
% SPHERE(AX,...) plots into AX instead of GCA.
```

```
%
```

```
% See also ELLIPSOID, CYLINDER.
```

```
% Clay M. Thompson 4-24-91, CBM 8-21-92.
```

```
% Copyright 1984-2002 The MathWorks, Inc.
```

MATLAB-funksjon (m-fil)

```
>> type distance
```

```
function result = distance(t)
%This function calculates the distance
%a falling object travels due to gravity
    %meters per second squared
result = 1/2*g*t.^2;
```

```
>> |
```

Egendefinert funksjon



# Søkesti

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- Søkesti benyttes for å gjøre .m-filer (f.eks. funksjoner) i visse mapper tilgjengelig i andre mapper.
- Skriv `>> pathtool` i kommandovinduet (eller velg “File” -> “Set Path...”)
- Legg inn mappene du vil skal være tilgjengelig slik at innholdet i de kan kalles opp i andre mapper