

# Mecanismos

## Prof. Jorge Luiz Erthal

### Síntese de came e seguidor

### Função deslocamento

4.2 Displacement Functions and Graphical Cam Synthesis 12

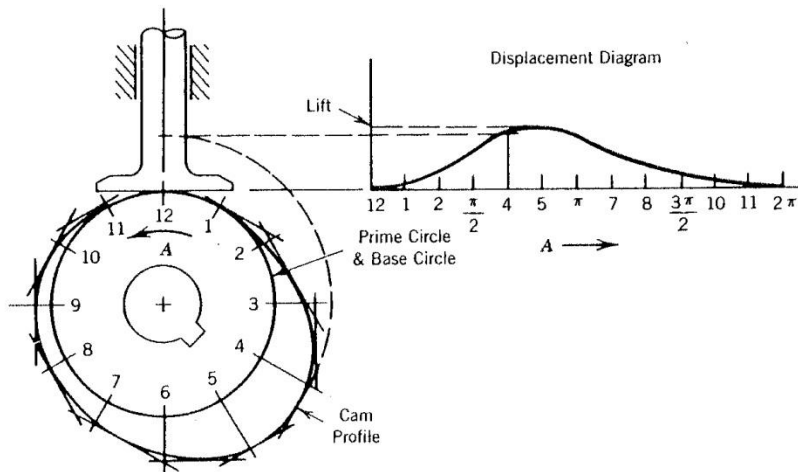


FIGURE 4.4 Graphical Design of a Cam with Flat-Faced Translating Follower

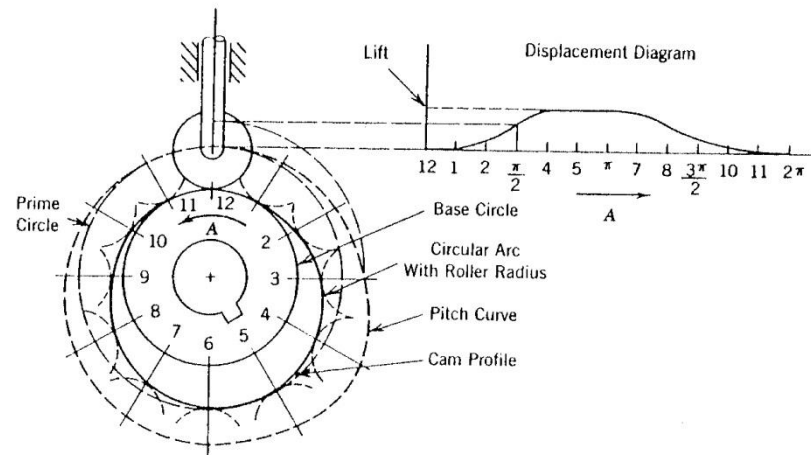


FIGURE 4.5 Graphical Design of a Cam With Radial, Translating Follower

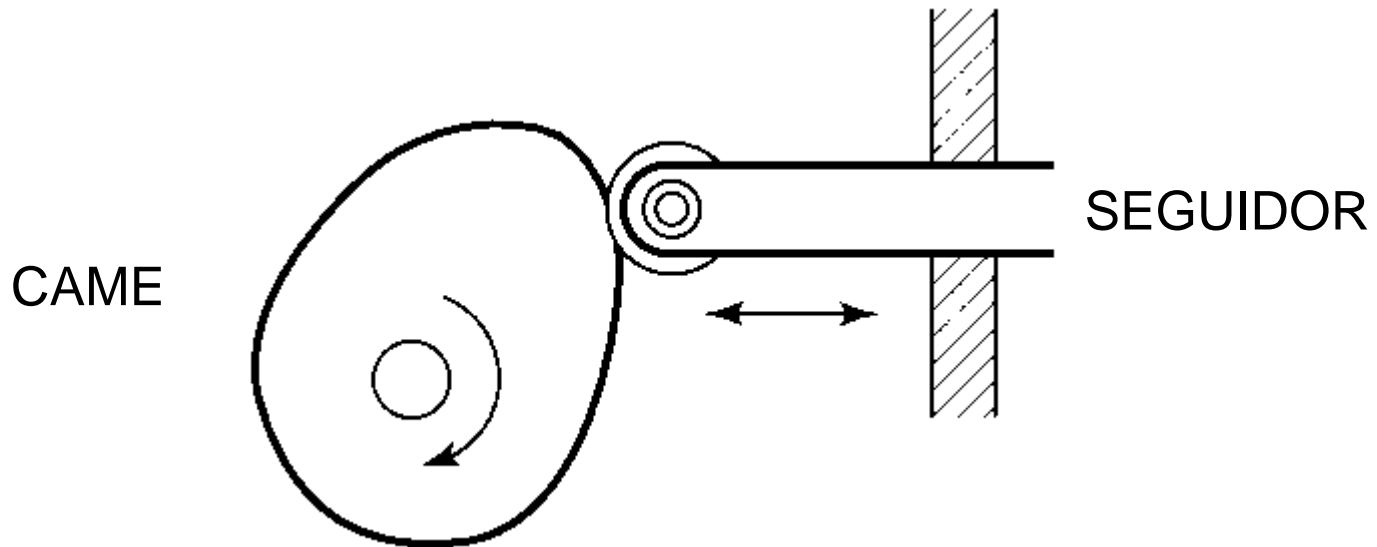
# Nesta aula

- Cames
  - Definição
  - Classificação
- Função deslocamento

# Definição

- Cames

- Mecanismo composto por duas peças principais (came e seguidor), cuja função é produzir movimento alternativo de forma rápida e precisa.



# Exemplo



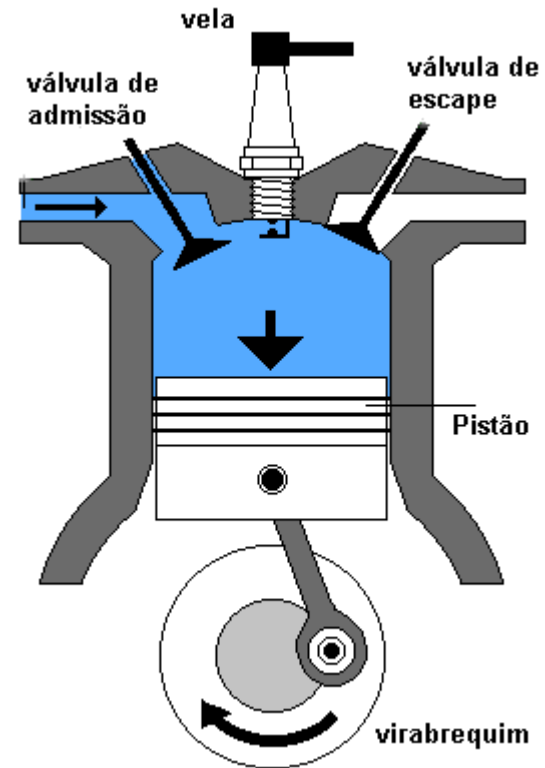
# Exemplo



# Exemplo



# Exemplo



## [How an engine works](#)

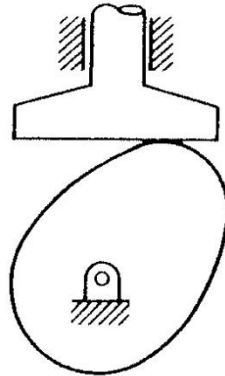
comprehensive tutorial animation featuring Toyota engine technologies

# Tipos de seguidor

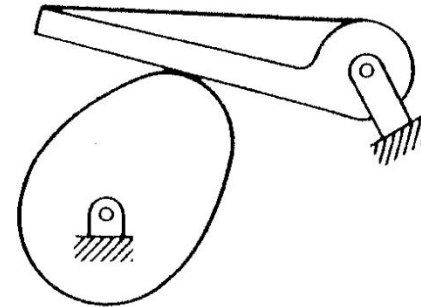
de translação

oscilante

de face plana

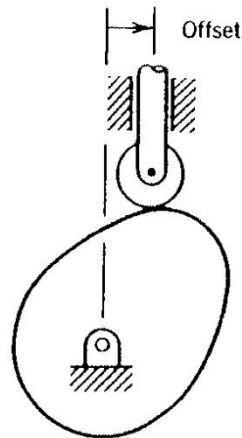


(a) Flat-faced, Translating Follower

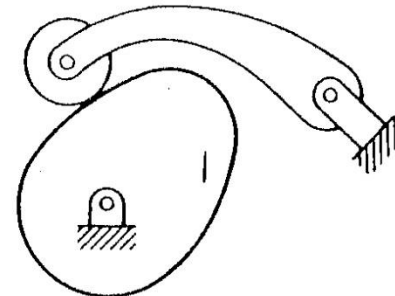


(b) Flat-faced, Pivoted Follower

com rolete



(c) Offset Roller Follower



(d) Pivoted Roller Follower

FIGURE 4.1 Common Disk Cam and Follower Systems

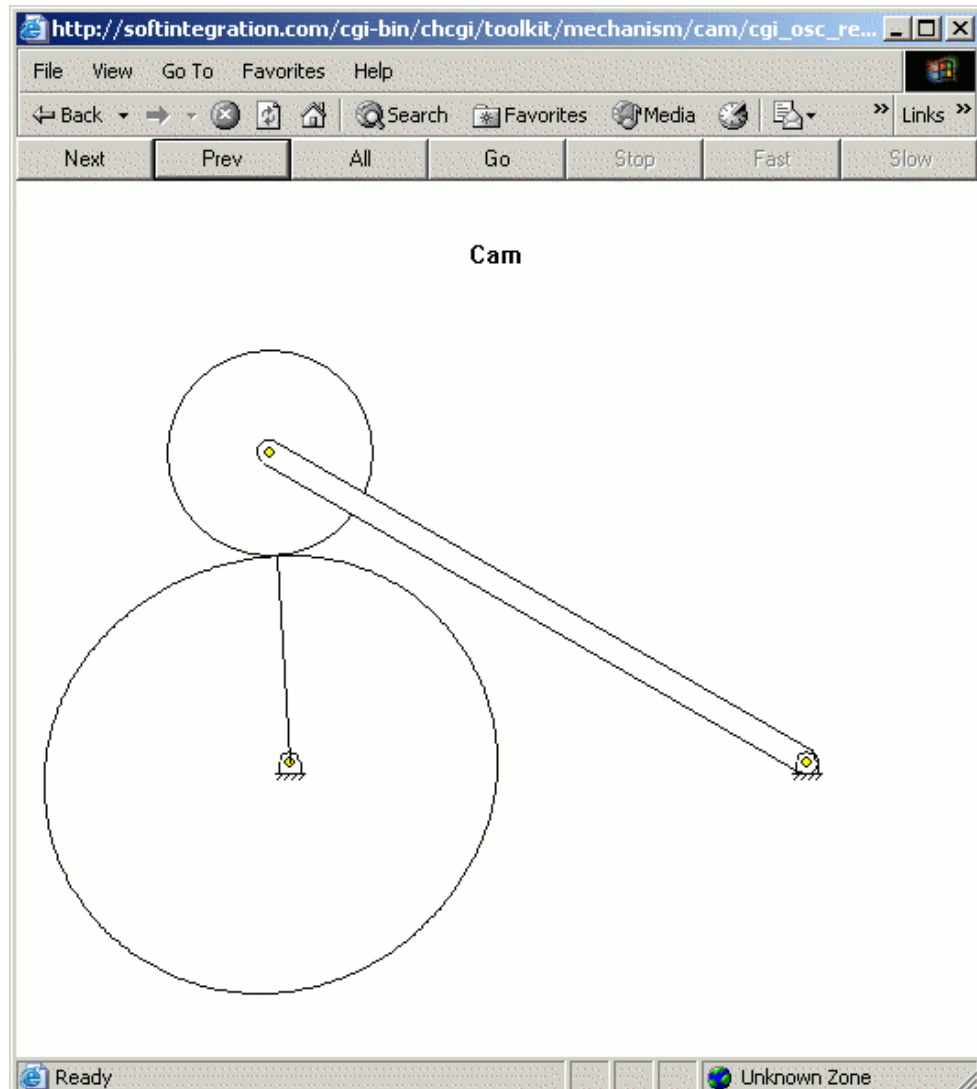
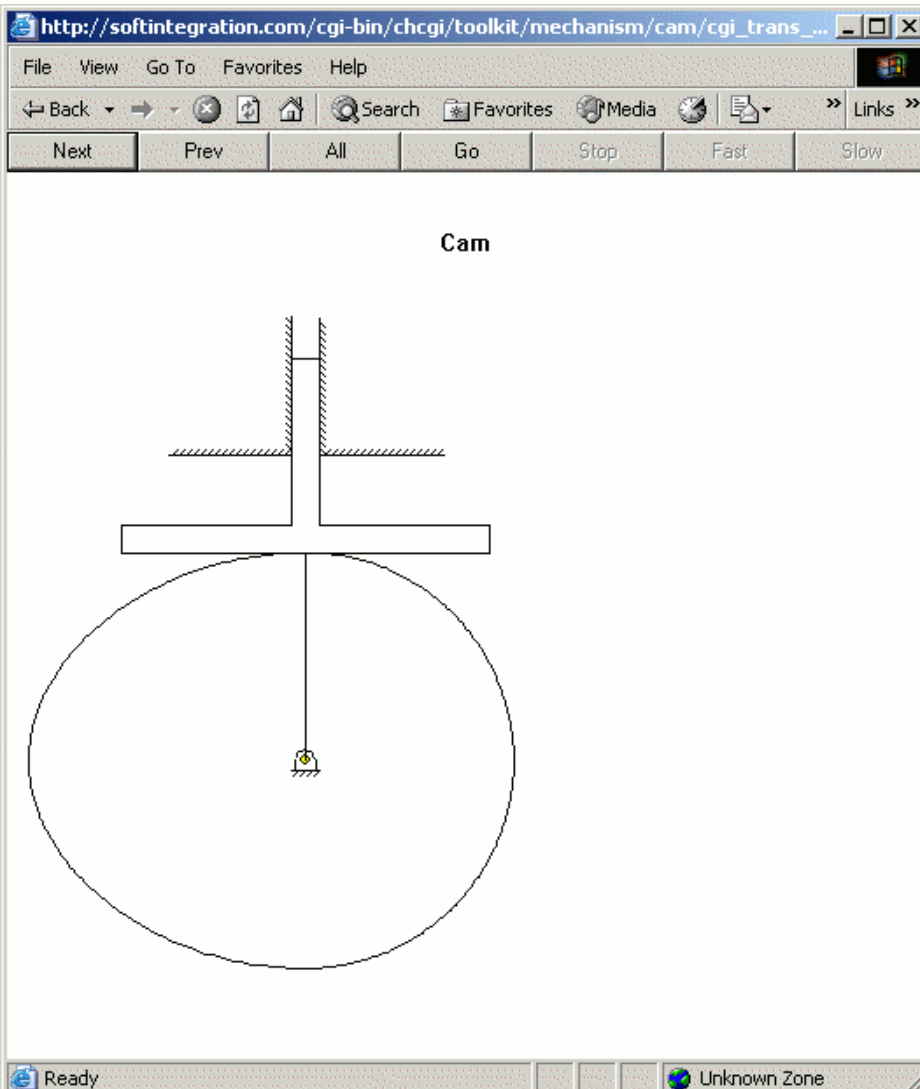


# Tipos de seguidor

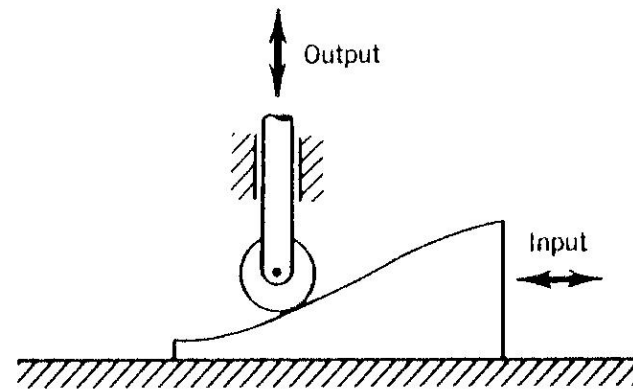
<http://www.softintegration.com/chhtml/toolkit/mechanism/cam/>

**de translação de face plana**

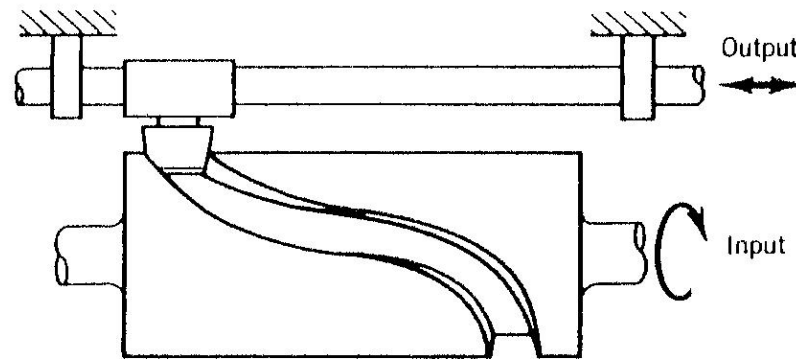
**oscilante com rolete**



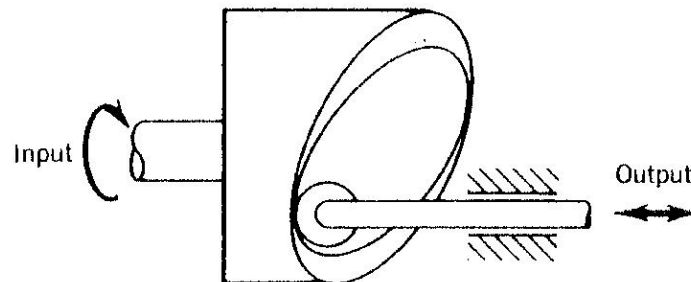
# Tipos



(a) Wedge Cam With Roller Follower



(b) Barrel Cam With Translating Roller Follower



(c) Face Cam With Roller Follower

FIGURE 4.2 Various Other Cam and Follower Systems

# Tipos

- Exemplos de cames
  - seguidor de ponta
  - seguidor de rolo
  - seguidor de rolo 2
  - [termos](#)
  - comando de válvulas
  - comando de válvulas do motor
  - [brinquedo](#)
  - [explicação](#)



# Exemplos

<http://www.mechanisms101.com/camshaft.html>

<http://www.mechanisms101.com/desmodromics.html>

# Síntese gráfica de cames

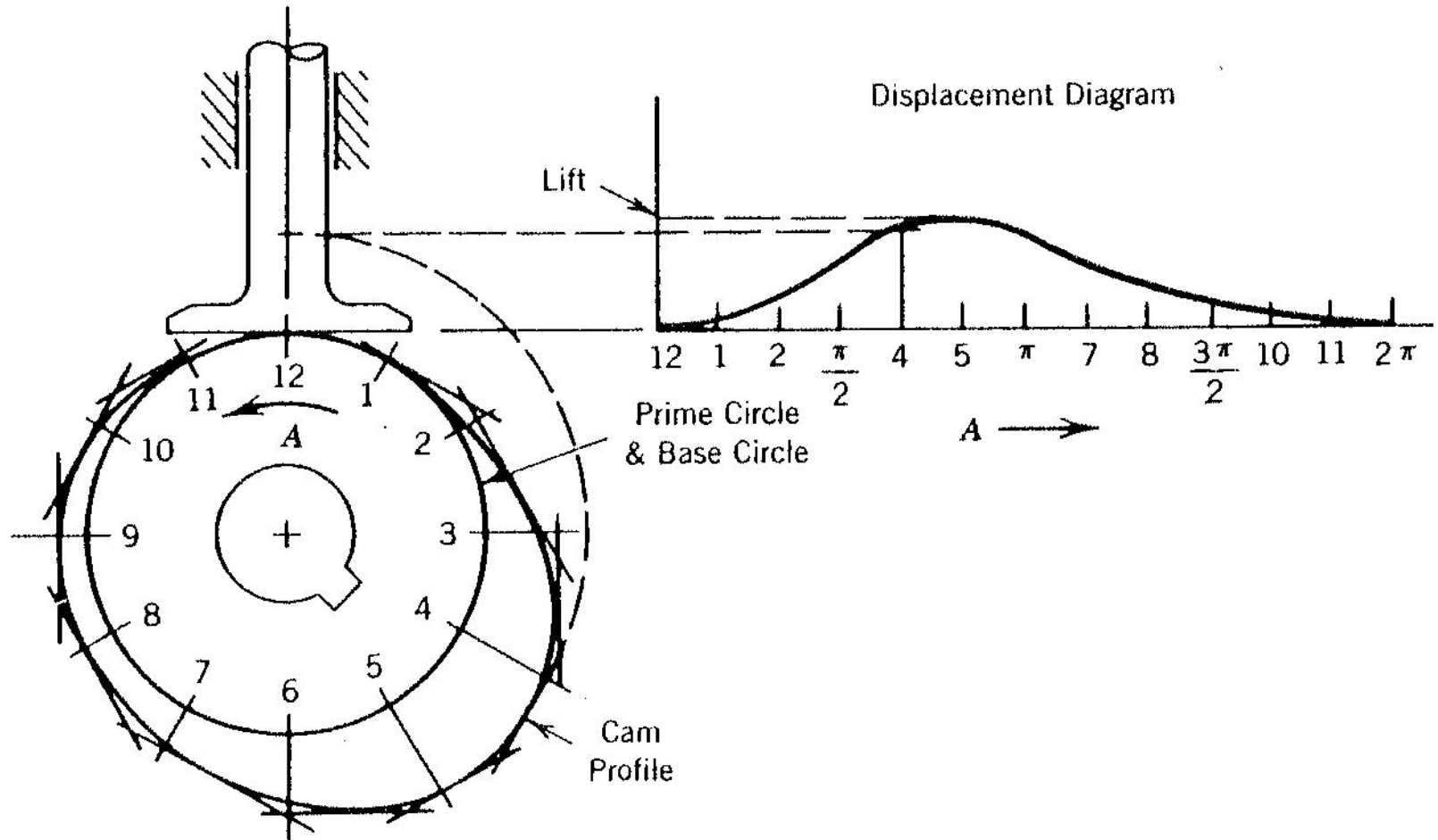


FIGURE 4.4 Graphical Design of a Cam with Flat-Faced Translating Follower

# Síntese gráfica de cames

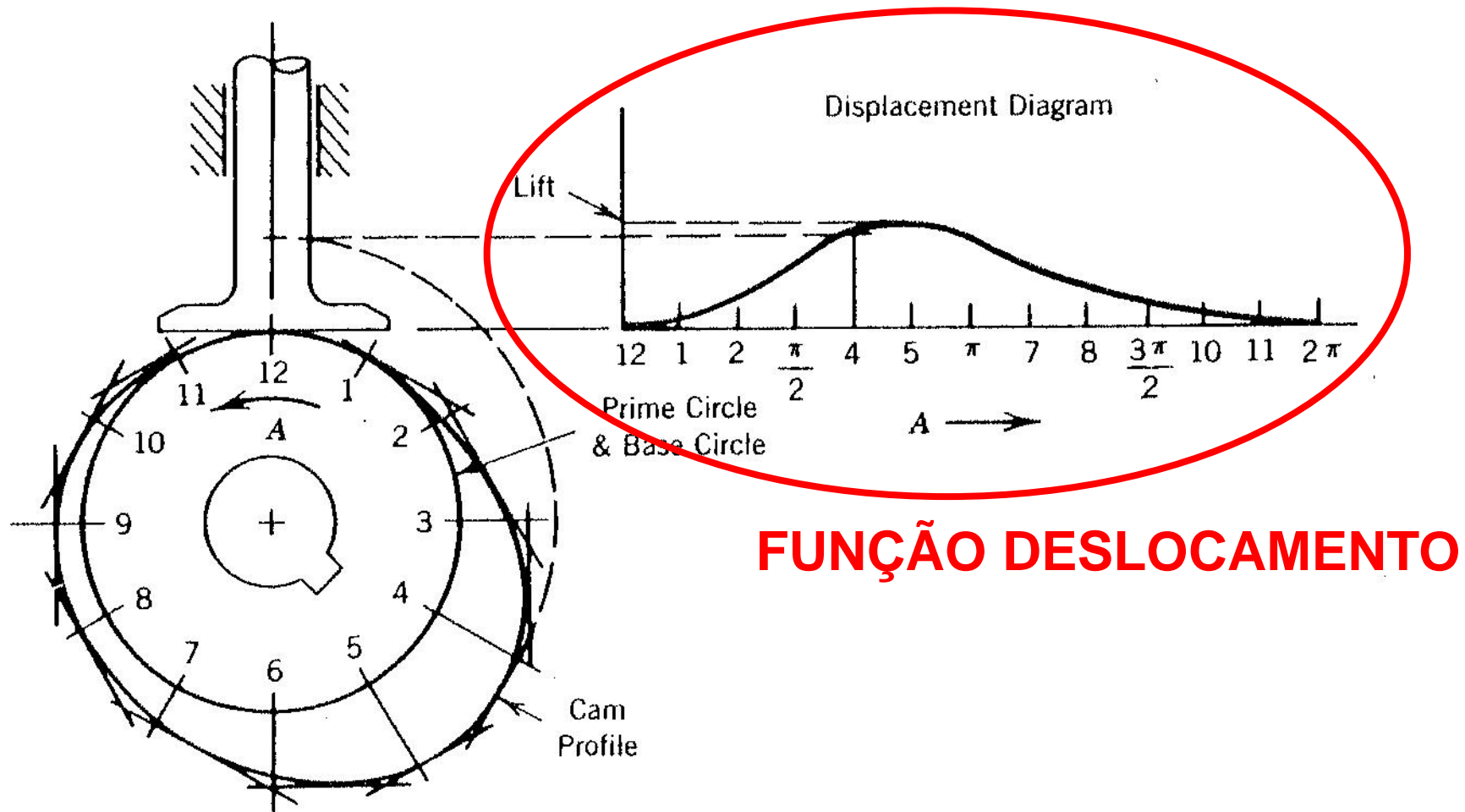


FIGURE 4.4 Graphical Design of a Cam with Flat-Faced Translating Follower

# Síntese gráfica de cames

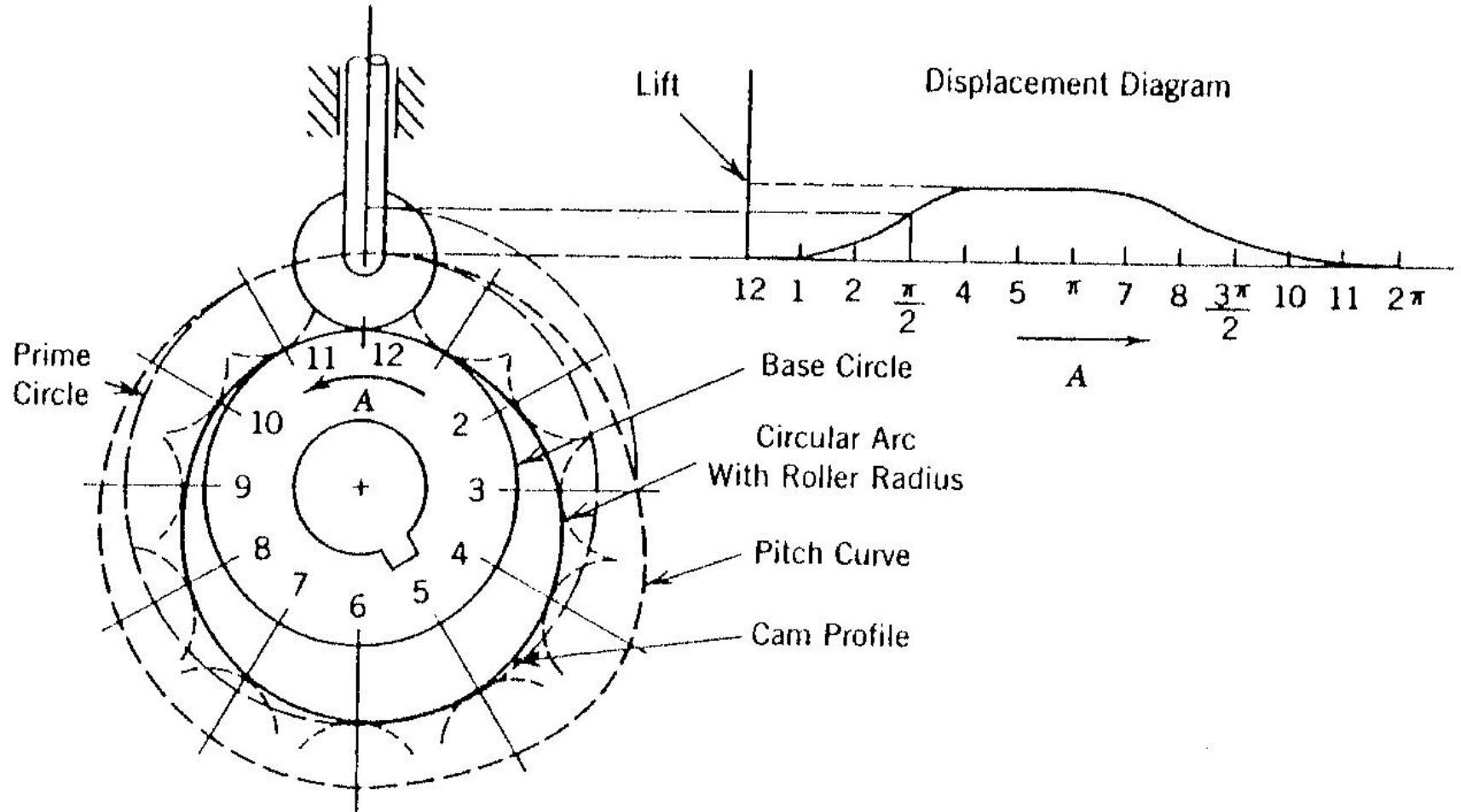
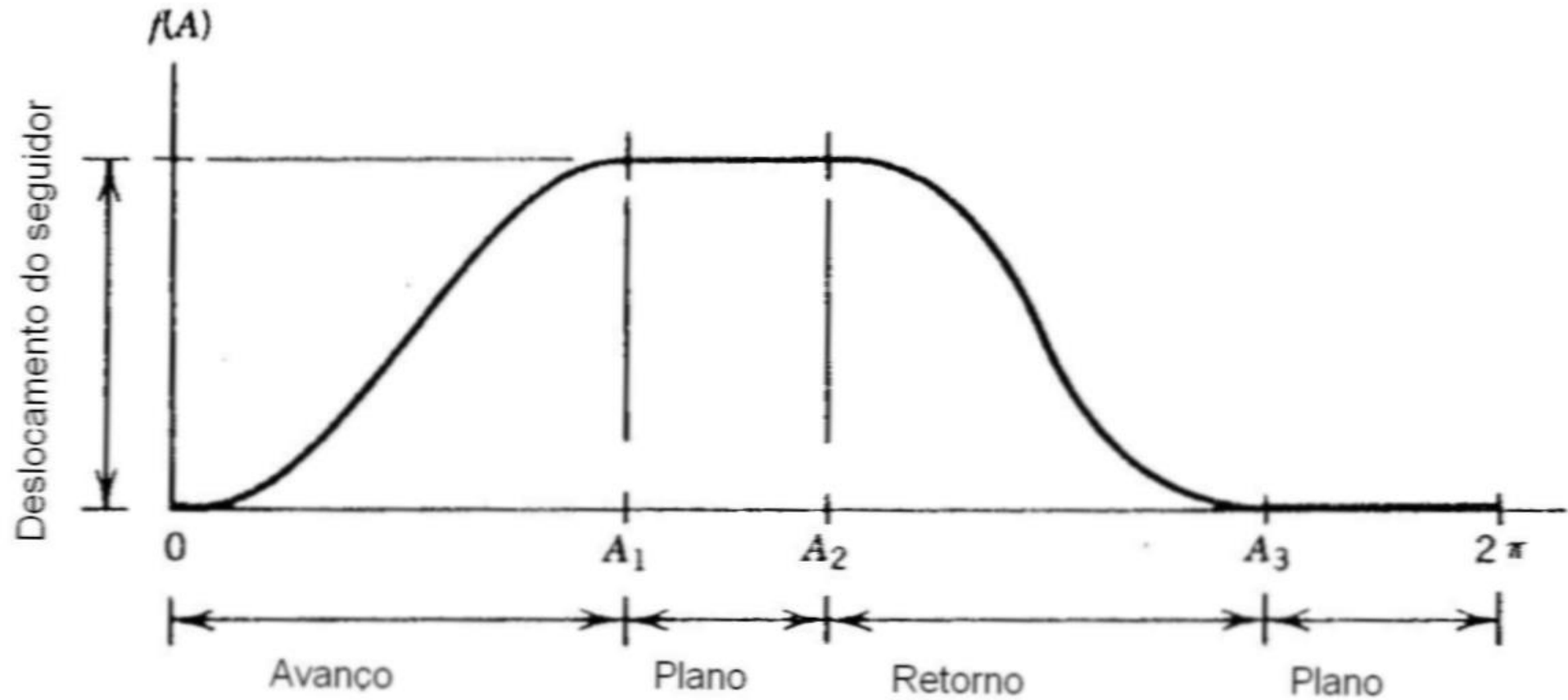


FIGURE 4.5 Graphical Design of a Cam With Radial, Translating Follower

# Síntese analítica (função deslocamento)





# Síntese analítica (função deslocamento)

TABLE 4.1 Elementary Rise Curves

Name	Functional Form	
Parabolic	$f(A) = 2L(A/A_1)^2$	$0 \leq A < A_1/2$
	$= L\{1 - 2[(A_1 - A)/A_1]^2\}$	$A_1/2 \leq A < A_1$
Cubic	$f(A) = 4L(A/A_1)^3$	$0 \leq A < A_1/2$
	$= L\{1 - 4[(A_1 - A)/A_1]^3\}$	$A_1/2 \leq A < A_1$
Sinusoidal	$f(A) = \frac{L}{2} \left[ 1 - \cos \left( \frac{\pi A}{A_1} \right) \right]$	$0 \leq A < A_1$
Cycloidal	$f(A) = \frac{L}{\pi} \left[ \frac{\pi A}{A_1} - \frac{1}{2} \sin \left( \frac{2\pi A}{A_1} \right) \right]$	$0 \leq A < A_1$

where

$f(A)$  = cam-follower displacement

$L$  = lift, maximum follower displacement

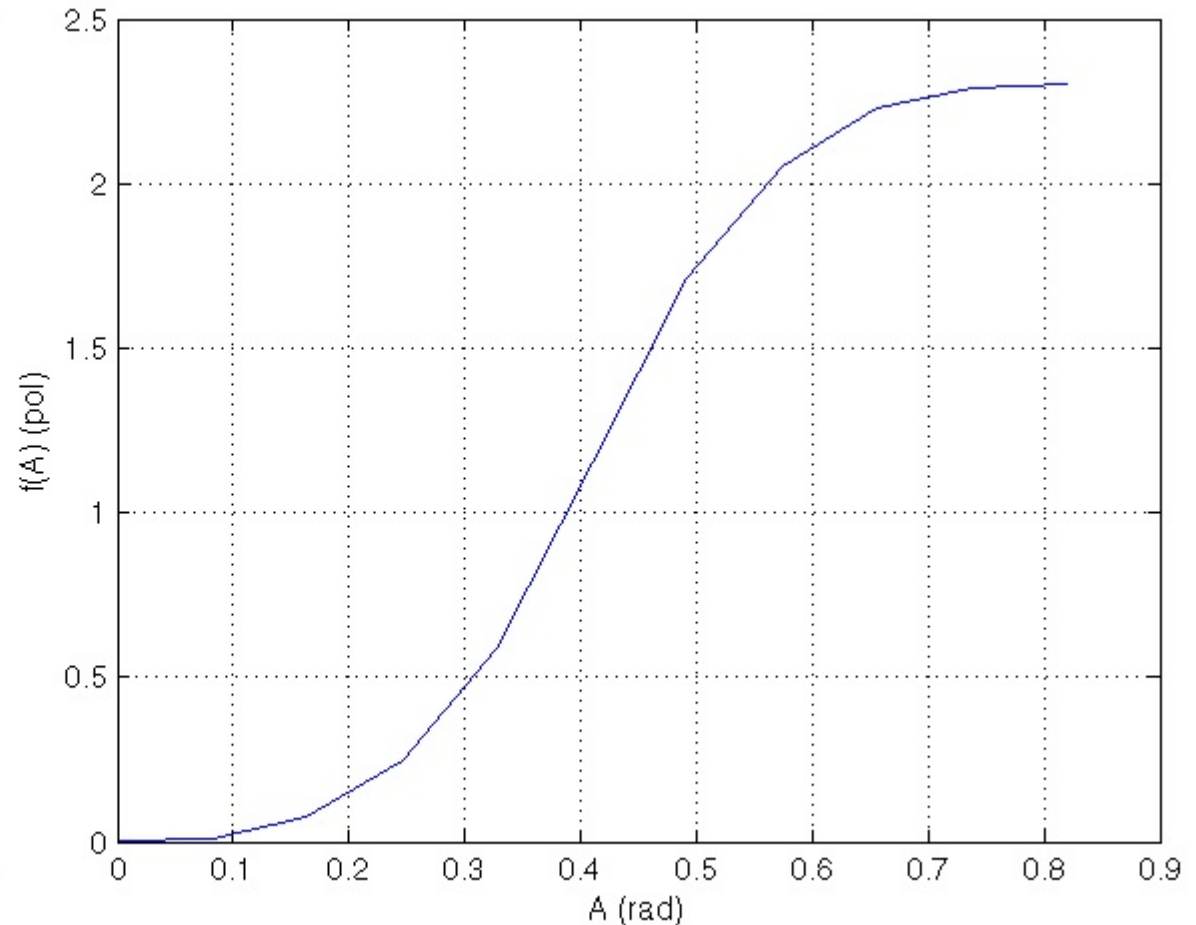
$A$  = cam rotation

$A_1$  = angular duration of the rise

# Síntese analítica (função deslocamento)

```
=====
% Mecanismos
% Exercício 4.1 (Doughty)
=====
clear all
close all
clc

A1=0.82;
L=2.3;
NP=11;
for i=1:NP
    A(i)=(i-1)/(NP-1)*A1;
    if A(i)<=A1/2
        f(i)=4*L*(A(i)/A1)^3;
    else
        f(i)=L*(1-4*((A1-A(i))/A1)^3);
    end
end
figure('name','Função deslocamento')
plot(A,f)
xlabel('A (rad)')
ylabel('f(A) (pol)')
grid on
```



# Síntese analítica (função deslocamento)

Tabela completa (avanço e retorno)  
arquivo: [Curvas Elementares](#)

Ver também Norton (2010)

# Exemplo

- Exercício 4.6

Construir a função deslocamento contendo os seguintes intervalos:

deslocamento do seguidor :  $L = 15 \text{ mm}$

avanço senoidal  $\Rightarrow 0 \leq A < 77^\circ$

plano  $\Rightarrow 77^\circ \leq A < 100^\circ$

retorno parabólico  $\Rightarrow 100^\circ \leq A < 242^\circ$

plano  $\Rightarrow 242^\circ \leq A < 360^\circ$

# Referência

Doughty, S.. MECHANICS OF MACHINES. New York:  
John Wiley, 1988.

Capítulo 4