Biconvex lens of variable thickness

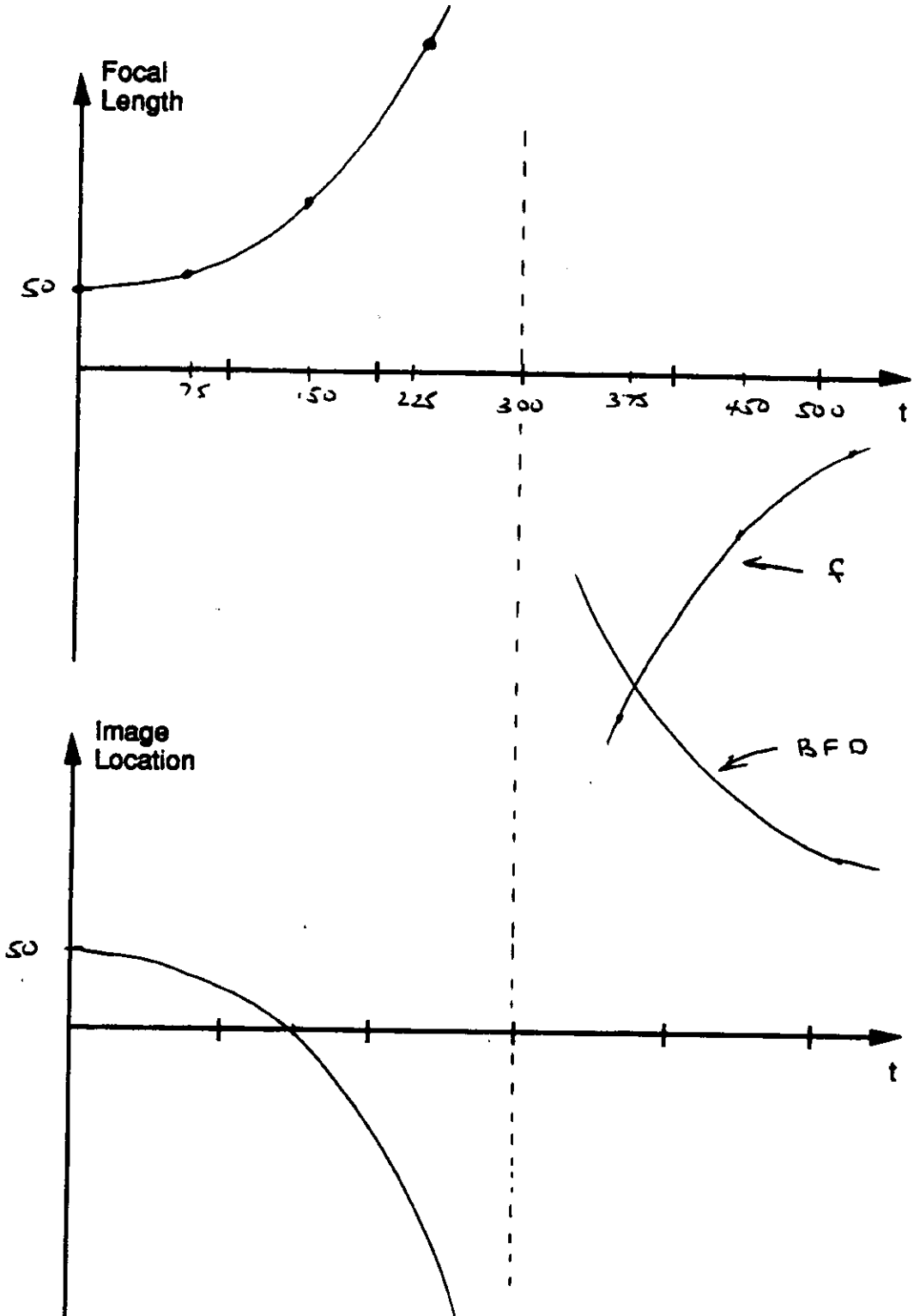
$n = 1.5$ $R = 50$ mm ($R_1 = 50$ mm ; $R_2 = -50$ mm

a) $\phi = \phi_1 + \phi_2 - \phi_1 \phi_2 t$ $f' = \frac{1}{\phi}$ $(n' = 1)$

$d' = \delta' = -\frac{\phi_1}{\phi} t$ $BFD = f' + d'$

$\phi_1 = \phi_2 = \Delta n C = \frac{.5}{50} = .01/mm$

t	ϕ	f'	d'	BFD	$x = t n$
0	.02	50	0	50	0
50	.015	67	-33.33	33.33	75
100	.01	100	-100	0	150
150	.005	200	-300	-100	225
200	0	∞	–	–	300
250	-.005	-200	500	300	375
300	-.01	-100	300	200	450
350	-.015	-67	233	166	525



Instruments + Classes for Part b)

(A) (B) (C)

Zone (1) (2) (3)

b)

The rear focal point of the first surface is 150 mm from the surface

Instruments

(A) ($t=0$) Thin Lens

(B) ($t=150$) Second Surface at Image → Field Lens

(C) ($t=300$) Telescope (intermediate image at the front focal point of the rear surface)

Zones

(1) ($0 < t < 150$) Thick Lens - real image outside lens

(2) ($150 < t < 300$) Intermediate image formed inside the glass rod. This image is inside the front focal point of the second surface. The second surface acts as a magnifier and a virtual image is produced.

(3) ($t > 300$) The intermediate image is outside the front focal point of the second surface. A real final image is formed. This is equivalent to a relay system. Note that the system focal length is negative since P' and F' for the system are reversed.