

G9SINGCV

Convave single refracting surface

r is negative, light from left propagating from medium with n1 to medium with n2
xo on left of surface (negative)

Calculation for 4 positions for real and virtual objects, to the left and right of the object focus and image focus.

Calculation of xi from given xo, refractive indices and radius of curvature
Calculation of magnification

Image focus $r = -10$ $n1 := 1$ $n2 := 1.5$ Object focus

$$x_{if} := n2 \cdot \frac{r}{n2 - n1} \quad x_{if} = -30 \quad x_{of} := n1 \cdot \frac{r}{n1 - n2} \quad x_{of} = 20$$

a

$$x_{1o} := -100$$

$$x_{1i} := \frac{n2}{\left(\frac{n2 - n1}{r}\right) + \frac{n1}{x_{1o}}} \quad mm1 := x_{1i} \cdot \frac{n1}{x_{1o} \cdot n2} \quad mm1 = 0.167$$

b

$$x_{1i} = -25$$

$$x_{2o} := -20$$

$$x_{2i} := \frac{n2}{\left(\frac{n2 - n1}{r}\right) + \frac{n1}{x_{2o}}} \quad mm2 := x_{2i} \cdot \frac{n1}{x_{2o} \cdot n2} \quad mm2 = 0.5$$

c

$$x_{2i} = -15$$

$$x_{3o} := 10$$

$$x_{3i} := \frac{n2}{\left(\frac{n2 - n1}{r}\right) + \frac{n1}{x_{3o}}} \quad mm3 := x_{3i} \cdot \frac{n1}{x_{3o} \cdot n2} \quad mm3 = 2$$

d

$$x_{3i} = 30$$

$$x_{4o} := 100$$

$$x_{4i} := \frac{n2}{\left(\frac{n2 - n1}{r}\right) + \frac{n1}{x_{4o}}} \quad mm4 := x_{4i} \cdot \frac{n1}{x_{4o} \cdot n2} \quad mm4 = -0.25$$

$$x_{4i} = -37.5$$