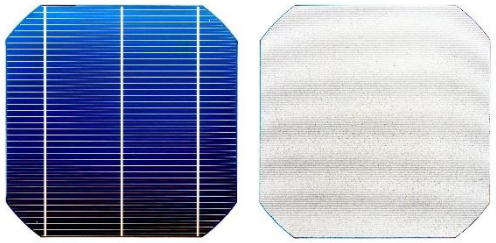
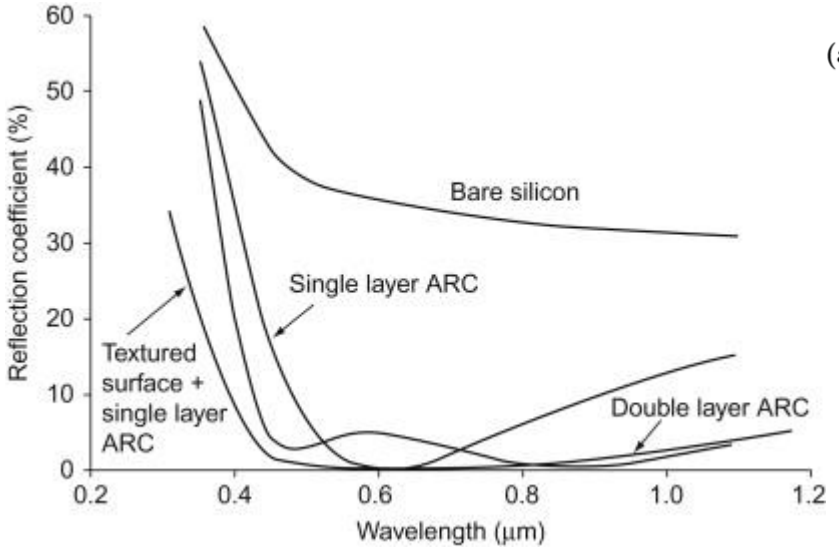
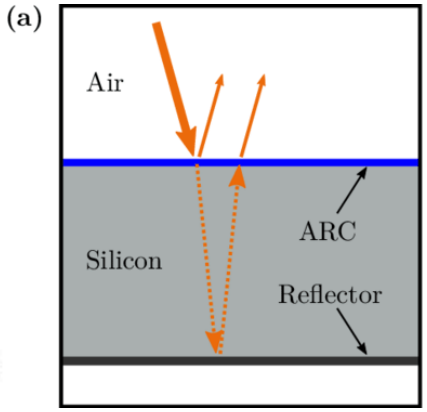


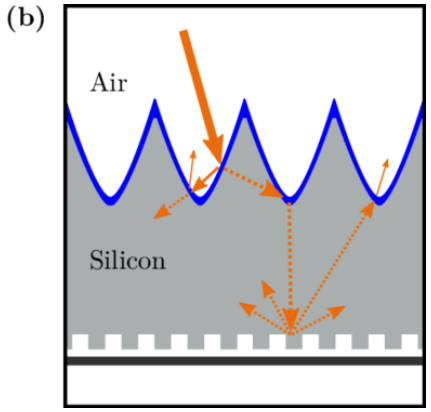
Wykład 7
12.06.2024 r.
Wyznaczanie grubości cienkich warstw

Katarzyna Gwóźdź

Odbicie



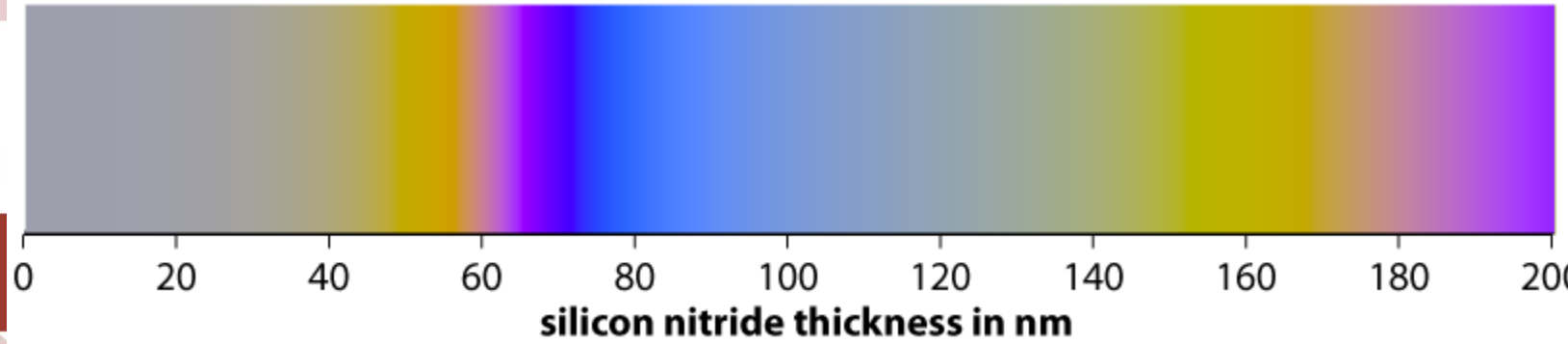




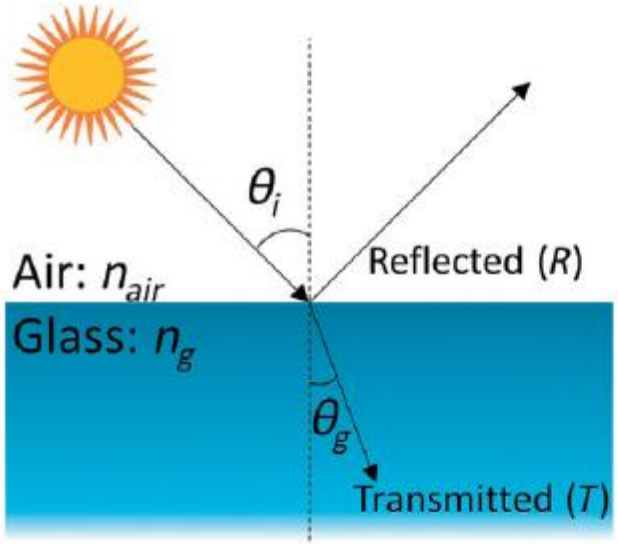
Anti-reflective coating

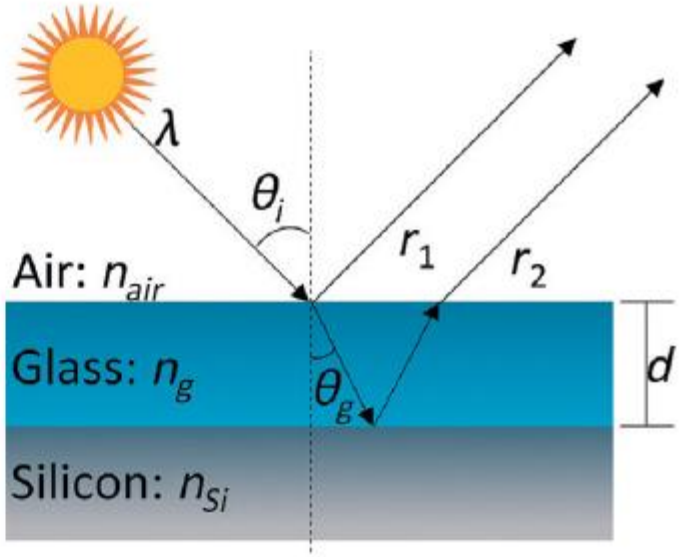
Krzem

Materiały ARC:
SiO_2
TiO_2
Si_3N_4



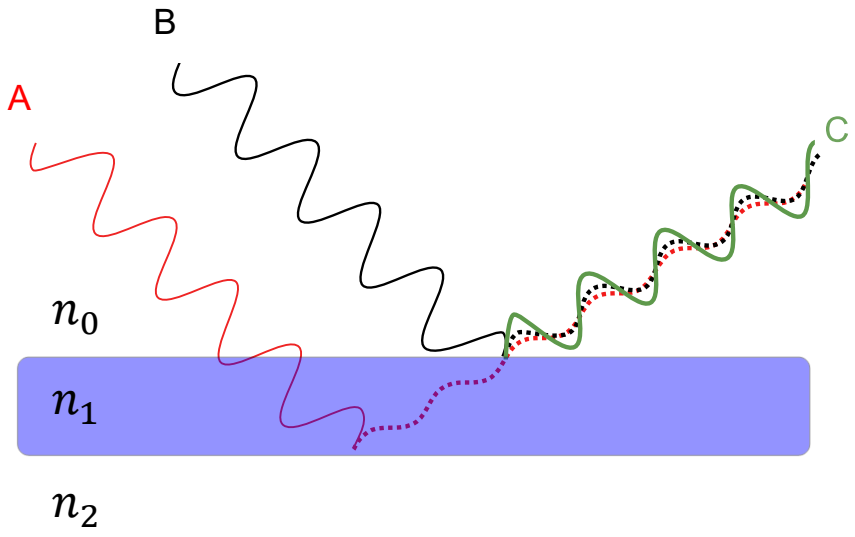
Warstwy antyrefleksyjne



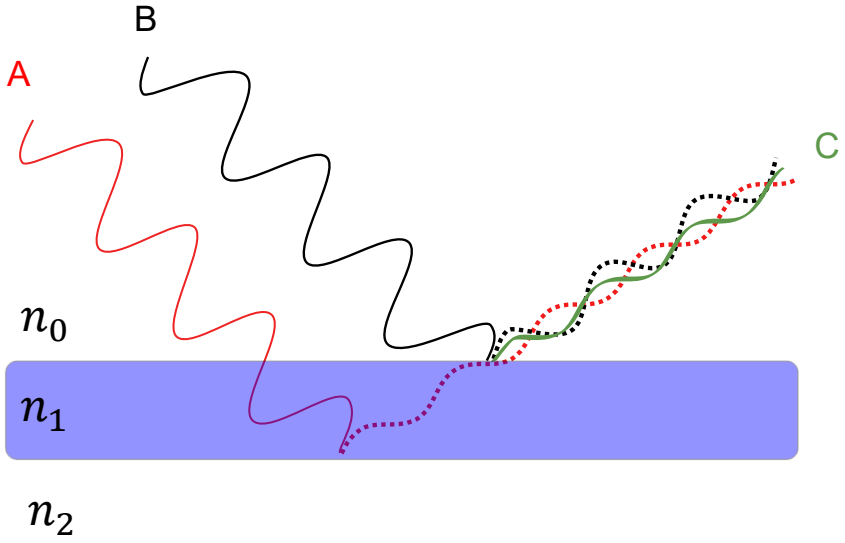


Interferencja

Konstruktywna



Destruktywna



$$n_0 < n_1 < n_2$$

$$2n_1 d = m\lambda$$

$$2n_1 d = \left(m + \frac{1}{2}\right)\lambda$$

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Rząd prążka

Konstruktywna

$$\lambda_2 < \lambda_1$$

Destruktywna

$$2n_1 d = m\lambda_1$$

$$2n_1 d = (m+1)\lambda_2$$

$$m\lambda_1 = m\lambda_2 + \lambda_2$$

$$m = \frac{\lambda_2}{\lambda_1 - \lambda_2}$$

$$2n_1 d = \left(m + \frac{1}{2}\right)\lambda_1$$

$$2n_1 d = \left(m + \frac{3}{2}\right)\lambda_2$$

$$m\lambda_1 + \frac{1}{2}\lambda_1 = m\lambda_2 + \frac{3}{2}\lambda_2$$

$$m = \frac{3\lambda_2 - \lambda_1}{2(\lambda_1 - \lambda_2)}$$

Grubość warstwy

Konstruktywna

$$2n_1 d = m\lambda_{max}$$

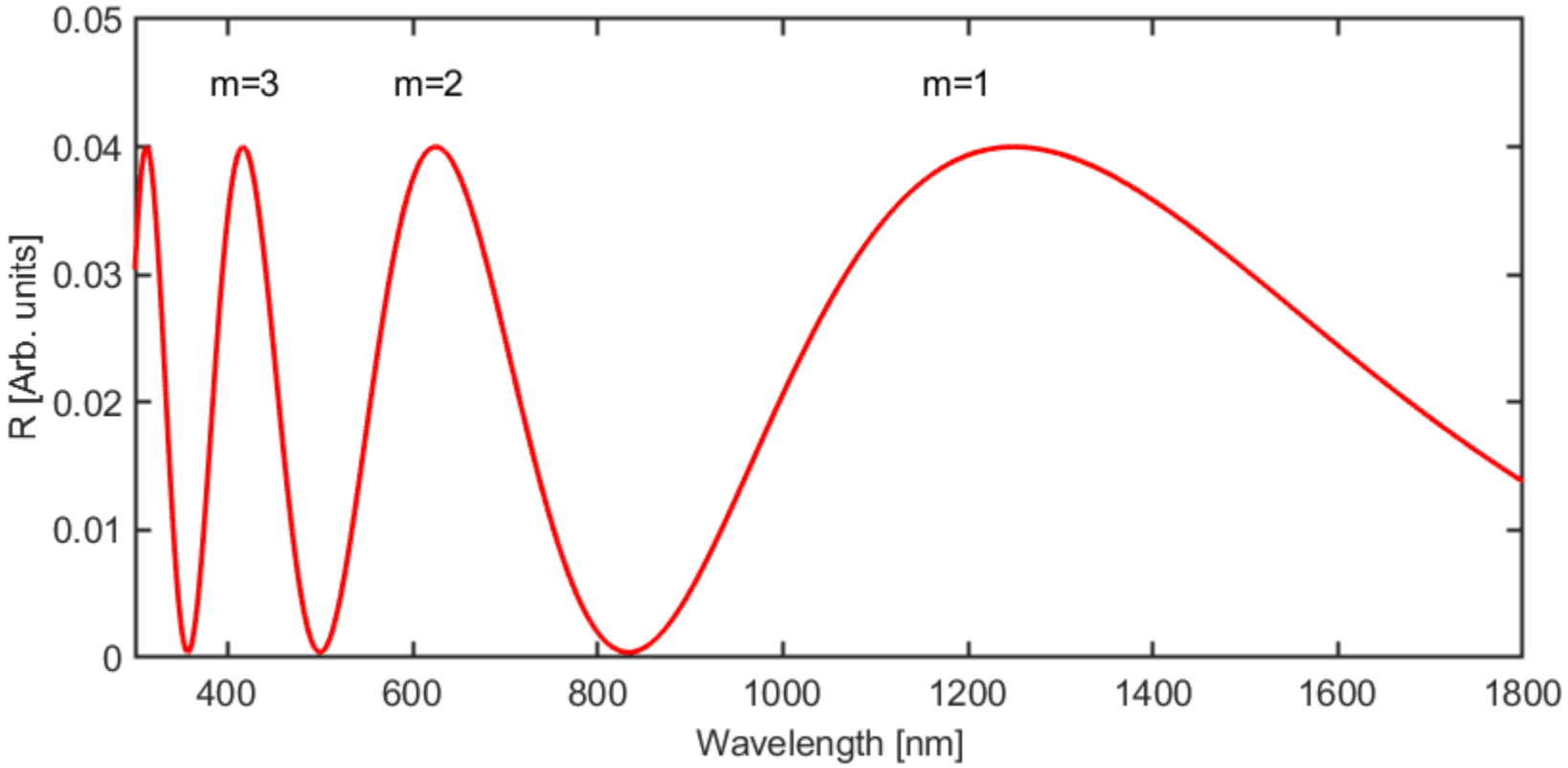
$$d = \frac{m\lambda_{max}}{2n_1}$$

Destruktywna

$$2n_1 d = \left(m + \frac{1}{2}\right)\lambda_{min}$$

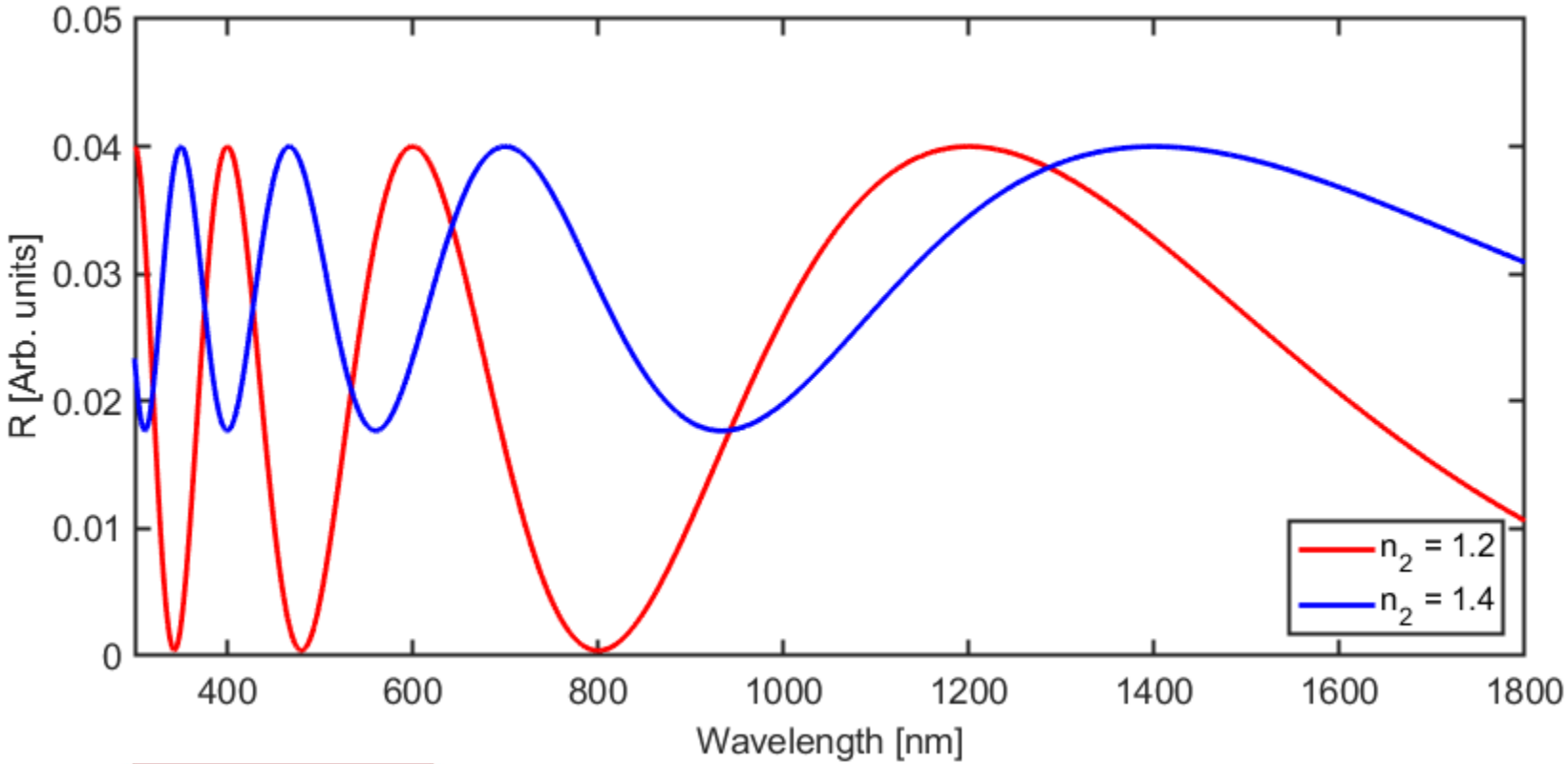
$$d = \frac{\left(m + \frac{1}{2}\right)\lambda_{min}}{2n_1}$$

Spektrum odbicia



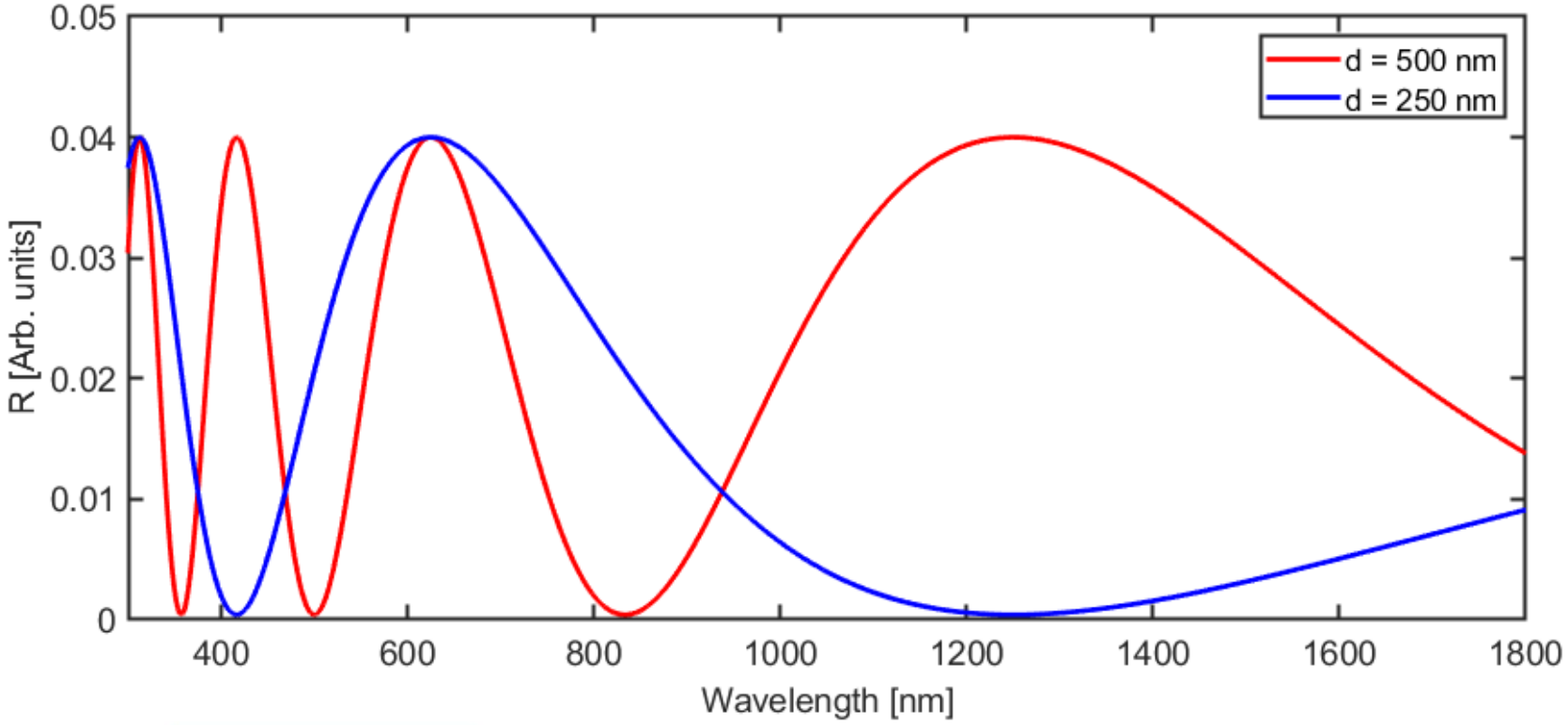
$n_1 = 1; n_2 = 1.2; n_3 = 1.5; d = 500\ nm$

Spektrum odbicia

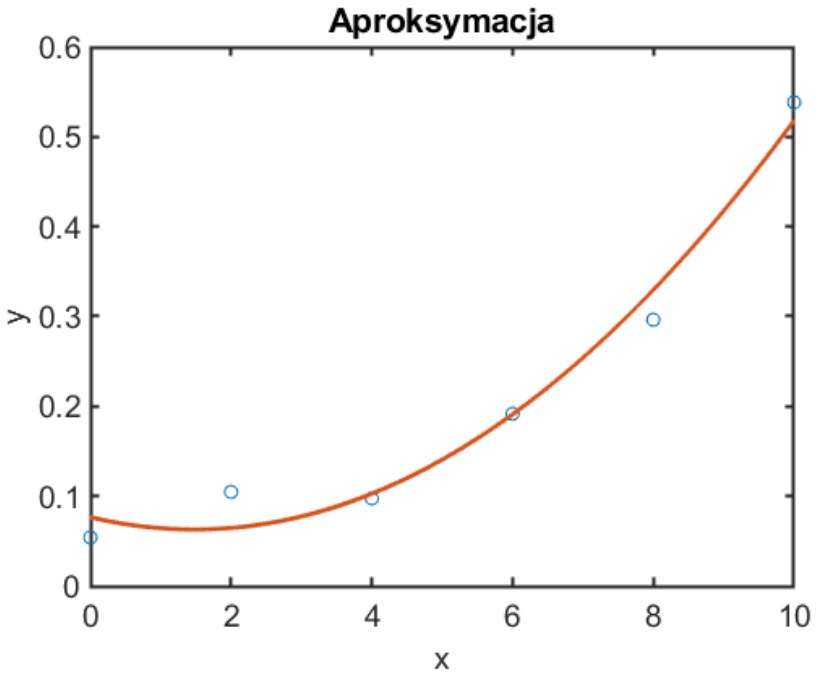


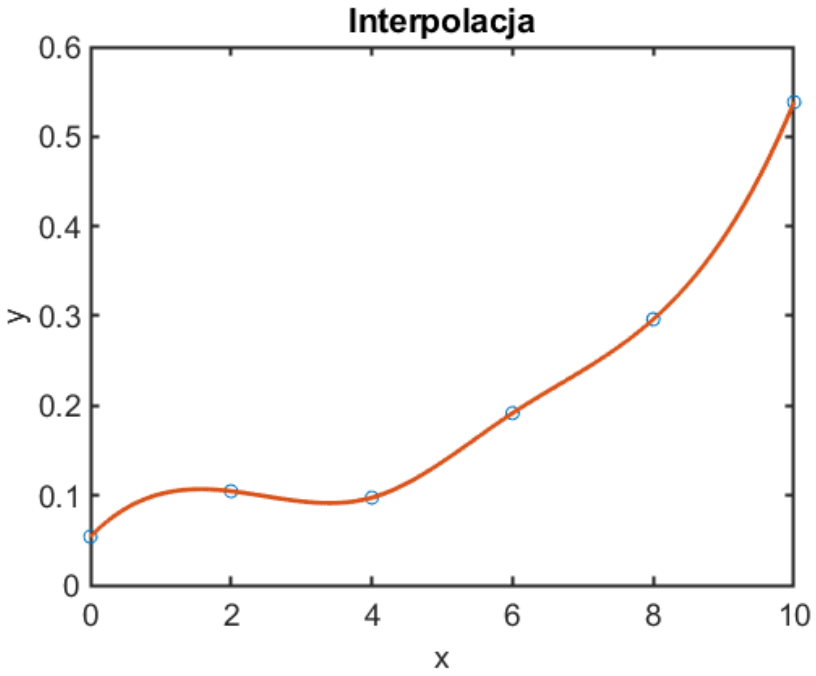
$n_1 = 1;\ n_3 = 1.5; d = 500\ nm$

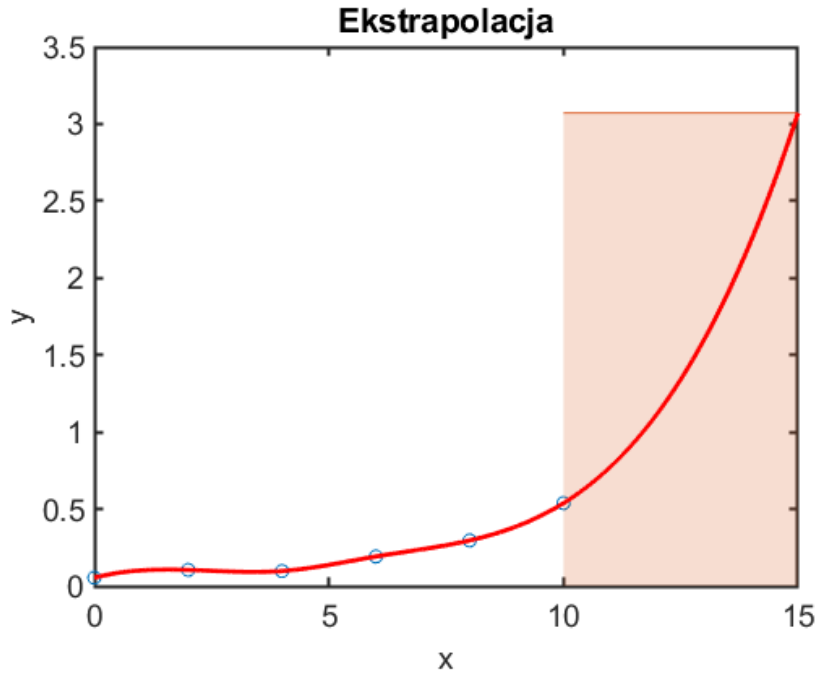
Spektrum odbicia



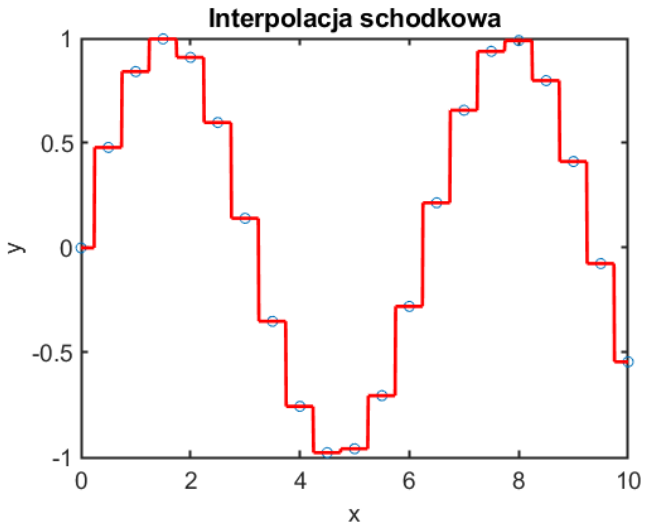
Interpolacja

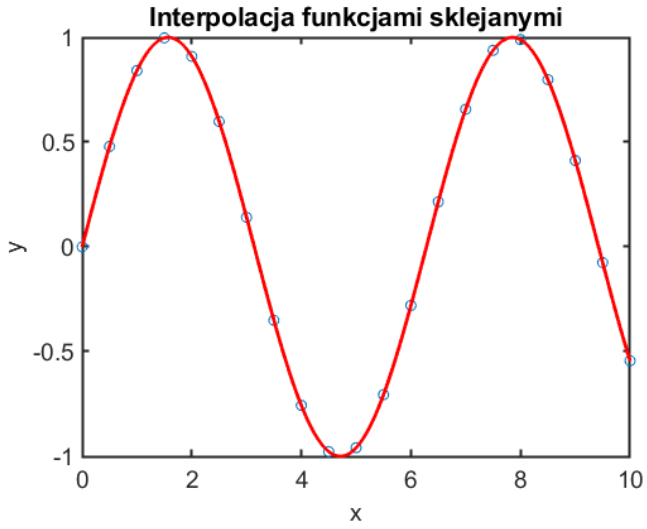






Interpolacja

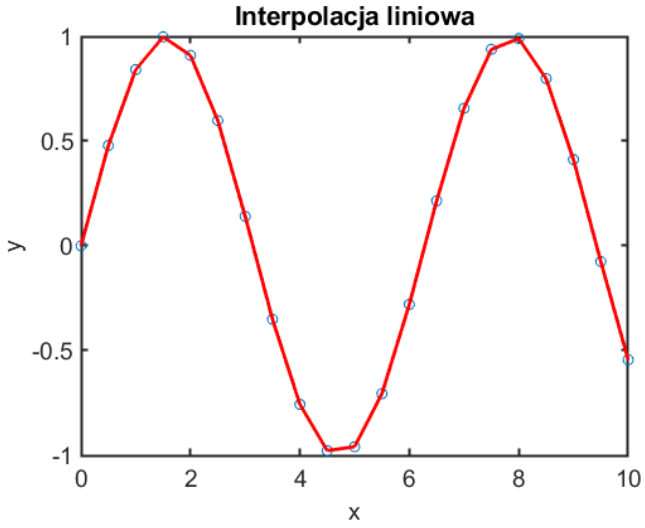




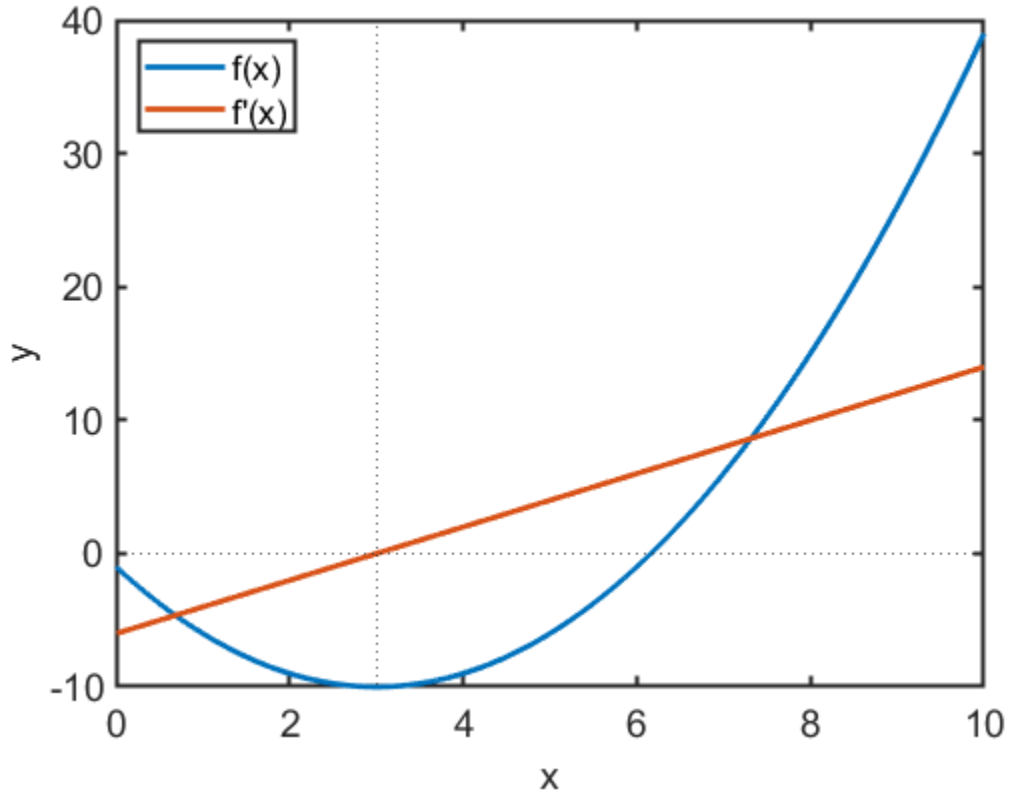

```
y2 = interp1(x,y,x2,"nearest");
```

```
y3 = interp1(x,y,x3,"linear");
```

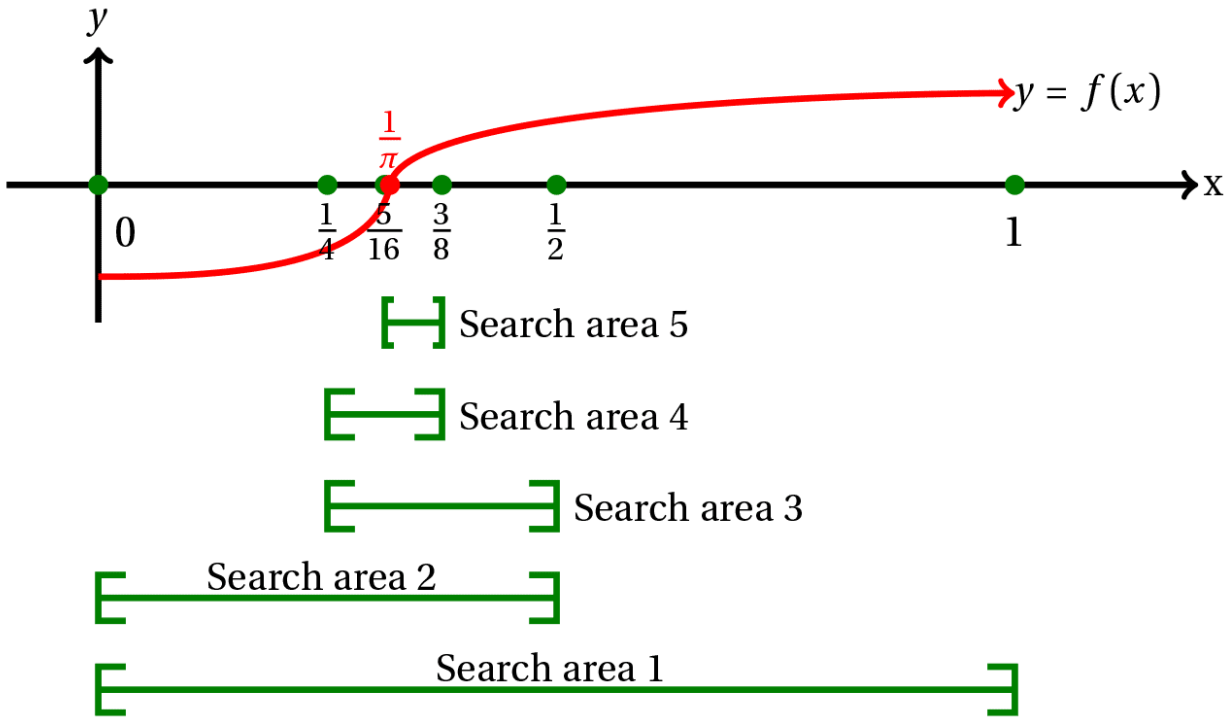
```
y4 = interp1(x,y,x4,"spline");
```



Szukanie ekstremów



Szukanie miejsc zerowych
Metoda bisekcji



Szukanie miejsc zerowych Metoda Newtona

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$