Physics 108 Homework Assignment#3 (due on 4/20/15 and 5/12/15)

Reading materials:

Pedrotti 3rd Edition: Chapter 18: 18-1 through 18-10
Lecture Notes: pp. 24-33

Homework: (Pedrotti 3rd Edition)

From Pedrotti 3rd Edition Chapter 5 and Chapter 18
1. (Optional for extra point) Derive refraction matrix and translation matrix yourself
2. (Optional for extra point) Derive the reflection matrix using same convention.
3. A thick double meniscus lens in air is used to image an object placed at a distance $s_0 = 40$ cm in front of the lens

$$\begin{align*}
\frac{n_1}{s_0} + \frac{n_2}{s_i} &= \frac{(n_2 - n_1)}{R} \\
&= (2 - 1)/20 \\
&= 0.05
\end{align*}$$

(a) Using the refraction equation $n_1/s_0 + n_2/s_i = (n_2 - n_1)/R$ and treating the lens as two spherical surfaces separated by 20 cm, find the location and the linear magnification of the image after refraction at the second surface; (b) Find the ABCD matrix for this lens; (c) Using the ABCD matrix, find the location after the second surface; (d) Using the ABCD matrix, find the linear magnification of the image.
4. 18-9
5. 18-12
6. 18-14
7. 4-11 (Math review)
8. 4-12 (Math review)
9. 4-13 (Math review)
10. 5-4 (Math review)
11. **(Due 5/11/15) Landscape Lens**: Perform the Introductory Exercise on Landscape Lens using OSLOEDU software. Show YOUR results by (1) displaying the starting “Surface Data” and “Lens Drawing” for paraxial rays and non-paraxial rays; and (2) displaying your optimized “Surface Data” and “Lens Drawing” for paraxial rays and non-paraxial rays. (You may also try the following condition for start: and “draw off”).

<table>
<thead>
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<th>SRF</th>
<th>RADIUS</th>
<th>THICKNESS</th>
<th>APERTURE RADIUS</th>
<th>GLASS</th>
<th>SPE</th>
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<td>OBJ</td>
<td>--</td>
<td>1.6000e+03</td>
<td>582.352375</td>
<td>AIR</td>
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<td>21.807957 V</td>
<td>4.000000</td>
<td>11.666830 S</td>
<td>BK7</td>
<td>C</td>
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<td>4.341641 AS</td>
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<td>--</td>
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12. **(Due 5/11/15) 18-23** Use the lens specifications and OSLOEDU to (a) find the focal length of Proctor photographic lens and (b) find the ABCD matrix for such a lens.