$$E_p = \frac{A_o}{\sqrt{2}} \int_{u_1}^{u_1} e^{i\pi u^2/2} du$$

You will be analyzing the Fresnel diffraction of a slit where $\Delta u = u_2 - u_1 = 0.4$. Your constant Δu will "snake" along the Cornu spiral and you will use the Fresnel Integral Table for accurate reading of the values in the Cornu spiral. **Since this analysis is tedious by hand, you may turn in a single Excel Spreadsheet file**, where you cut and paste[1] the Fresnel Integral Table values into the spreadsheet, let the spreadsheet do all the calculations, and let it display a nice smooth graph of the irradiance. In either case, be sure to include a title for the graph and label each axis as described below.

HW1. Fresnel Integral Table. Complete the table by hand or with a spreadsheet for "snaking" around the Cornu spiral where the slit width has a corresponding $\Delta u = u_2 - u_1 = 0.4$. You can either use the Fresnel Integral Table in our Chapter or use the footnote[1] to set up a spreadsheet. Be very careful with you entries because in order to get full credit for HW2, your table in HW1 needs to be correct. The value $u = (u_1 + u_2)/2$ is the average.

u	u_1	u_2	$C(u_1)$	$S(u_1)$	$C(u_2)$	$S(u_2)$
-2.0	-4.0	0.0	-0.4984	-0.4205	0.000	0.000
-1.8	-3.8	0.2				
-1.6	-3.6	0.4				
-1.4	-3.4	0.6				
-1.2	-3.2	0.8				
-1.0	-3.0	1.0				
-0.8	-2.8	1.2				
-0.6	-2.6	1.4				
-0.4	-2.4	1.6				
-0.2	-2.2	1.8				
0.0	-2.0	2.0				
0.2	-1.8	2.2				
0.4	-1.6	2.4				
0.6	-1.4	2.6				
0.8	-1.2	2.8				
1.0	-1.0	3.0	-0.7799	-0.4383	0.6057	0.4963
1.2	-0.8	3.2				
1.4	-0.6	3.4				
1.6	-0.4	3.6				
1.8	-0.2	3.8				
2.0	0.0	4.0	0.000	0.000	0.4984	0.4205

[1]Click on keisan. Then choose initial value -5, increment 0.1, and repetition 101. Then press Execute. You will then be able to cut and paste the results into a spreadsheet with 10 significant figures of accuracy! Note that keisan lists the S(x) first (to the left) and the C(x) second (to the right). You may use this ordered listing in your spreadsheet if you want.

HW2. Fresnel Diffraction Pattern.

$$E_p = \frac{A_o}{\sqrt{2}} \int_{u_1}^{u_1} e^{i\pi u^2/2} du \qquad I_p = \frac{1}{2}\left| \frac{A_o}{\sqrt{2}} \int_{u_1}^{u_1} e^{i\pi u^2/2} du \right|^2 \qquad I_o = \frac{1}{2} A_o^2$$

The relative irradiance is $$I \equiv \frac{I_p}{I_o} = \left| \frac{1}{\sqrt{2}} \int_{u_1}^{u_1} e^{i\pi u^2/2} du \right|^2 .$$

You can report two significant figures for I or up to as many as you use for C(u) and S(u).

u	u_1	u_2	ΔC(u)	ΔS(u)	I
-2.0	-4.0	0.0	0.4984	0.4205	0.21
-1.8	-3.8	0.2			
-1.6	-3.6	0.4			
-1.4	-3.4	0.6			
-1.2	-3.2	0.8			
-1.0	-3.0	1.0			
-0.8	-2.8	1.2			
-0.6	-2.6	1.4			
-0.4	-2.4	1.6			
-0.2	-2.2	1.8			
0.0	-2.0	2.0			
0.2	-1.8	2.2			
0.4	-1.6	2.4			
0.6	-1.4	2.6			
0.8	-1.2	2.8			
1.0	-1.0	3.0	1.3856	0.9346	1.40
1.2	-0.8	3.2			
1.4	-0.6	3.4			
1.6	-0.4	3.6			
1.8	-0.2	3.8			
2.0	0.0	4.0	0.4984	0.4205	0.21

Sketch a smooth plot of I against u for the above data where your vertical axis is labeled from 0.2 to 1.6 with increments of 0.2 along the vertical axis. The range for your horizontal u-axis and associated labels should be chosen to best accommodate the data in the table.