AST 300B – Spring 2018

In-class/take-home Problems Due: Monday Feb. 12

17. Observations of a supergiant star in the Upper Sco OB Association indicate that it has a spectral type of A5II with magnitudes of B = 5.38 mag and V = 4.55 mag. Assuming a standard R_V, (a) calculate the extinction toward the star at V and K bands and (b) calculate the hydrogen column density (cm^{-2}). Table 1 from Fitzgerald 1970, A&A, 4, 234 ("The Intrinsic Colours of Stars and Two-Colour Reddening Lines") is on the back.

18. Consider a UV to near-IR dust extinction law that varies with wavelength as a power-law $A_\lambda \sim \lambda^{-\beta}$ [mag].

(a) What power-law index β would give $R_V = 3.1$?
(b) If $\beta = 1$, what is the value of R_V?

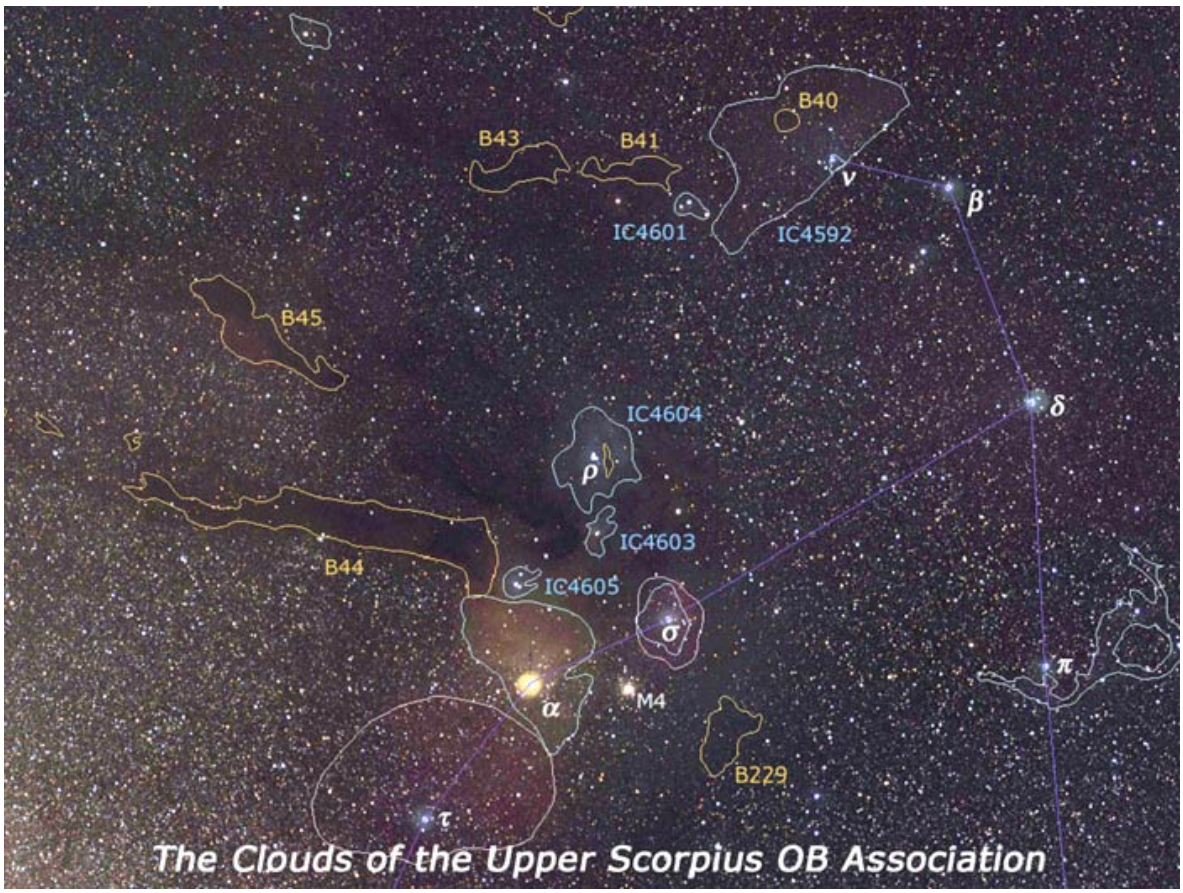

Table 1. *Adopted* $(B-V)_0$ *colours*

	V	IV-V	IV	III-IV	III	II-III	II	Ib	Iab	Ia
O5	−0.32									
O6	−0.32									
O7	−0.32									
O7.5	−0.31									
O8	−0.31				−0.31				−0.29	
O9	−0.31	−0.31	−0.31	−0.31	−0.31	−0.31	−0.31	−0.28	−0.28	−0.28
O9.5	−0.30	−0.30	−0.30	−0.30	−0.30	−0.30	−0.30	−0.27	−0.27	−0.27
B0	−0.30	−0.30	−0.30	−0.30	−0.30	−0.30	−0.29	−0.24	−0.24	−0.24
B0.5	−0.28	−0.28	−0.28	−0.28	−0.28	−0.30	−0.28	−0.22	−0.22	−0.22
B1	−0.26	−0.26	−0.26	−0.26	−0.26	−0.28	−0.24	−0.19	−0.19	−0.19
B1.5	−0.25	−0.25	−0.25	−0.25	−0.25	−0.27	−0.22	−0.17	−0.18	−0.18
B2	−0.24	−0.24	−0.24	−0.24	−0.24	−0.22	−0.21	−0.16	−0.17	−0.17
B2.5	−0.22	−0.22	−0.22	−0.22	−0.22	−0.20	−0.19	−0.15	−0.15	−0.15
B3	−0.20	−0.20	−0.20	−0.20	−0.20	−0.18	−0.17	−0.13	−0.13	−0.13
B4	−0.18	−0.18	−0.18	−0.18	−0.18					−0.11
B5	−0.16	−0.16	−0.16	−0.16	−0.16	−0.15	−0.14	−0.09	−0.09	−0.09
B6	−0.14	−0.14	−0.14	−0.14	−0.14	−0.13	−0.12	−0.07	−0.07	−0.07
B7	−0.13	−0.13	−0.13	−0.12	−0.12	−0.12	−0.12	−0.04	−0.04	−0.04
B8	−0.11	−0.10	−0.10	−0.10	−0.10	−0.10	−0.10	−0.02	−0.02	−0.01
B9	−0.07	−0.07	−0.07	−0.08	−0.08	−0.08	−0.06	−0.02	0.00	0.00
B9.5	−0.04	−0.04	−0.04	−0.05	−0.05	−0.04	−0.03	−0.01	0.00	0.01
A0	−0.01	−0.02	−0.02	−0.03	−0.03	−0.01	0.00	0.00	0.01	0.02
A1	0.02	0.01	0.00	0.01	0.01			0.02	0.03	0.03
A2	0.05	0.06	0.06	0.05	0.05			0.05	0.05	0.05
A3	0.08	0.09	0.09	0.09	0.09				0.06	0.06
A4	0.12	0.12	0.12	0.12	0.12				0.08	0.08
A5	0.15	0.15	0.15	0.15	0.15	0.13	0.10	0.10	0.10	0.10
A7	0.20	0.22	0.22	0.22	0.24		0.14	0.13	0.13	0.13
A8	0.27	0.27	0.26	0.26	0.26			0.14	0.14	0.14
A9	0.30	0.30	0.29	0.29	0.28		0.18	0.14	0.14	0.14
F0	0.32	0.30	0.30	0.30	0.32			0.15	0.15	0.15
F1	0.34	0.34	0.33	0.33	0.33			0.16	0.16	0.16
F2	0.35	0.38	0.37	0.37	0.36			0.18	0.18	0.18
F3	0.41	0.39	0.39	0.39	0.39					
F4	0.42	0.40	0.42	0.42	0.42					
F5	0.45	0.42	0.44	0.43	0.43		0.38	0.26	0.26	0.26
F6	0.48	0.48	0.46	0.46	0.46					
F7	0.50	0.49	0.50	0.49	0.48					
F8	0.53	0.51	0.53	0.52	0.52			0.55	0.55	0.55
F9	0.56	0.56	0.57							
G0	0.60	0.60	0.63	0.62	0.64		0.73	0.82	0.82	0.82
G1	0.62	0.60	0.63		0.69		0.80	0.85	0.85	0.85
G2	0.63	0.60	0.64		0.77		0.87	0.88	0.88	0.88
G3	0.65	0.60	0.66		0.85	0.86	0.87	0.92	0.92	0.92
G4	0.66	0.64	0.68		0.88	0.87	0.87			
G5	0.68	0.68	0.70	0.85	0.90	0.88	0.87	1.00	1.00	1.00
G6	0.72	0.73			0.92	0.92	0.91	1.04	1.04	1.04
G7	0.73	0.76			0.94	0.94	0.95	1.10	1.10	1.10
G8	0.74	0.80	0.82	0.89	0.95	0.96	0.99	1.14	1.14	1.14
G9	0.76	0.83	0.90	0.95	0.98	1.00	1.02	1.16	1.16	1.16