

A Student's Guide to the Mathematics of Astronomy

Daniel Fleisch
Wittenberg University

Julia Kregenow
Pennsylvania State University



Contents

<i>Preface</i>	<i>page</i>	vii
<i>Acknowledgements</i>		ix
1 Fundamentals	1	
1.1 Units and unit conversions	1	
1.2 Absolute and ratio methods	11	
1.3 Rate problems	23	
1.4 Scientific notation	28	
1.5 Chapter problems	39	
2 Gravity	41	
2.1 Newton's Law of Gravity	41	
2.2 Newton's Laws of Motion	51	
2.3 Kepler's Laws	55	
2.4 Chapter problems	64	
3 Light	66	
3.1 Light and spectrum fundamentals	66	
3.2 Radiation laws	73	
3.3 Doppler shift	86	
3.4 Radial-velocity plots	91	
3.5 Chapter problems	100	
4 Parallax, angular size, and angular resolution	102	
4.1 Parallax	102	
4.2 Angular size	106	
4.3 Angular resolution	110	
4.4 Chapter problems	120	

5 Stars	122
5.1 Stellar parallax	122
5.2 Luminosity and apparent brightness	126
5.3 Magnitudes	130
5.4 H-R diagram	139
5.5 Chapter problems	151
6 Black holes and cosmology	152
6.1 Density	153
6.2 Escape speed	159
6.3 Black holes	164
6.4 The expansion of the Universe	169
6.5 The history and fate of the Universe	183
6.6 Chapter problems	189
<i>Further reading</i>	191
<i>Index</i>	192