

1. Record Nr.	UNINA9910796078103321
Autore	Janke Steven J. <1947->
Titolo	Mathematical structures for computer graphics / / Steven J. Janke
Pubbl/distr/stampa	Hoboken, New Jersey : , : Wiley, , 2015 2015
ISBN	1-118-71212-9 1-118-71198-X
Descrizione fisica	1 online resource (xv, 392 pages) : illustrations
Classificazione	007.642 006.601/51
Disciplina	006.601/51
Soggetti	Computer graphics - Mathematics Three-dimensional imaging - Mathematics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Includes bibliographical references and index
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Preface iii -- 1 Basics -- 1 1.1 Graphics Pipeline -- 2 1.2 Mathematical Descriptions -- 5 1.3 Position -- 6 1.4 Distance -- 9 1.5 Complements and Detail -- 13 1.6 Exercises -- 17 2 Vector Algebra -- 21 2.1 Basic Vector Characteristics -- 22 2.2 Two Important Products -- 31 2.3 Complements and Details -- 42 2.4 Exercises -- 46 3 Vector Geometry -- 49 3.1 Lines & Planes -- 49 3.2 Distances -- 55 3.3 Angles -- 63 3.4 Intersections -- 65 3.5 Additional Key Applications -- 73 3.6 Homogeneous Coordinates -- 86 3.7 Complements and Details -- 90 3.8 Exercises -- 94 4 Transformations -- 99 4.1 Types of Transformations -- 100 4.2 Linear Transformations -- 101 4.3 Three dimensions -- 113 4.4 Affine Transformations -- 123 4.5 Complements and Details -- 134 4.6 Exercises -- 145 5 Orientation -- 149 5.1 Cartesian Coordinate Systems -- 151 5.2 Cameras -- 159 5.3 Other Coordinate Systems -- 182 5.4 Complements and Details -- 190 5.5 Exercises -- 193 6 Polygons & Polyhedra -- 197 6.1 Triangles -- 197 6.2 Polygons -- 213 6.3 Polyhedra -- 230 6.4 Complements and Details -- 245 6.5 Exercises -- 250 7 Curves & Surfaces -- 255 7.1 Curve Descriptions -- 256 7.2 Bezier Curves -- 268 7.3 B-Splines -- 278 7.4 NURBS -- 295 7.5 Surfaces -- 300 7.6 Complements and Details -- 311 7.7 Exercises -- 316 8 Visibility -- 321 8.1 Viewing --

321 8.2 Perspective Transformation -- 323 8.3 Hidden Surfaces -- 333
8.4 Ray Tracing -- 344 8.5 Complements and Details -- 351 8.6
Exercises -- 356 9 Lighting -- 359 9.1 Color Coordinates -- 359 9.2
Elementary Lighting Models -- 364 9.3 Global Illumination -- 384 9.4
Textures -- 391 9.5 Complements and Details -- 403 9.6 Exercises --
408 10 Other Paradigms -- 411 10.1 Pixels -- 412 10.2 Noise -- 421
10.3 L-Systems -- 435 10.4 Exercises -- 443 A Geometry &
Trigonometry -- 447 A.1 Triangles -- 447 A.2 Angles -- 449 A.3
Trigonometric Functions -- 450 B Linear Algebra -- 455 B.1 Systems of
Linear Equations -- 455 B.2 Matrix Properties -- 458 B.3 Vector Spaces
460.

Sommario/riassunto

This book is for readers who wish to understand the mathematical tools that are necessary to produce three-dimensional models and the resulting screen images. Written by an academic with over 20 years of teaching experience, the intent of the book is to show relevant and focused mathematical derivations that help students understand computer graphics. Intuitive, rather than just theorem/proof discussions set the tone for the presentation. Some algebra, high-school geometry, and trigonometry are presumed for adequate comprehension. Notions of why results are important give the reader a sense of ownership and application. Chapters are written in a two-tiered style so as to allow for flexibility in the level of mathematics desired. Two- and three-dimensional vector geometry is covered using transforms, curves, and surfaces. More focused graphics topics like perspective with the accompanying projective geometry, polyhedral as building blocks for objects, and ray retracing help pull the vector technique together. An assortment of other topics helps round-out the discussion. These include noise, randomness, and L-systems. Plentiful exercises are showcased throughout. An author-maintained web site includes further computer programming notes and solutions to selected exercises".