Table of Contents

Dedication iii
Preface xvii

Chapter 1: Exploring Maya Interface

Introduction to Autodesk Maya 1-2
Starting Autodesk Maya 2022 1-2
Autodesk Maya 2022 Screen Components 1-3
Menubar 1-5
Status Line 1-5
Shelf 1-18
Tool Box 1-20
Time Slider and Range Slider 1-25
Command Line 1-28
Help Line 1-28
Panel Menu 1-28
Panel Toolbar 1-29
Channel Box / Layer Editor 1-34
Attribute Editor 1-35
Hotkeys 1-36
Hotbox 1-37
Outliner 1-38
Marking Menus 1-38
Pipeline Caching 1-39
Alembic Cache 1-39
Interoperability Options in Maya 1-41
Navigating the Viewports 1-41
Hotkeys in Maya 1-41
Tips and Tricks in Maya 1-42
Workspaces 1-43
Self-Evaluation Test 1-44
Review Questions 1-44

Chapter 2: Polygon Modeling

Introduction 2-2
Polygon Primitives 2-2
Creating a Sphere 2-2
Creating a Cube 2-4
Creating a Prism 2-4
Creating a Pyramid 2-4
Creating a Pipe 2-5
Creating a Helix 2-5
Creating a Soccer Ball 2-5

Creating a Platonic Solid 2-6
Creating a Type Tool Mesh 2-6
Creating a SVG Mesh 2-7
Creating a Disc 2-7
Creating a Gear 2-8
Creating Super Shapes 2-8
Polygon Editing Tools 2-9
Booleans 2-9
Combine 2-11
Separate 2-11
Conform 2-11
Fill Hole 2-12
Reduce 2-13
Remesh 2-13
Retopologize 2-13
Smooth 2-13
Triangulate 2-14
Quadrangulate 2-14
Mirror 2-14
Editing the Polygon Components 2-14
Add Divisions 2-15
Bevel 2-16
Bridge 2-16
Circularize 2-17
Collapse 2-18
Connect 2-18
Detach 2-18
Extrude 2-19
Merge 2-19
Average Vertices 2-20
Chamfer Vertices 2-21
Delete Edge/Vertex 2-21
Edit Edge Flow 2-21
Duplicate 2-21
Editing the Polygon Components Using Mesh Tools 2-22
Create Polygon 2-22
Insert Edge Loop 2-22
Multi-Cut 2-23
Offset Edge Loop 2-23
Tutorial 1 2-24
Tutorial 2 2-31
Tutorial 3 2-41
Self-Evaluation Test 2-54
Review Questions 2-55
Exercise 1 2-56
Exercise 2 2-56
Exercise 3 2-56

Chapter 3: NURBS Curves and Surfaces

Introduction		3-2
NURBS Primitives		3-2
Creating a Sphere		3-2
Creating a Cube		3-6
Creating a Cylinder		3-8
Creating a Cone		3-9
Creating a Plane		3-10
Creating a Torus		3-11
Creating a Circle		3-13
Creating a Square		3-14
Interactive Creation		3-14
Exit on Completion		3-14
Working with NURBS Components		3-15
Tools for Creating NURBS Curves		3-16
CV Curve Tool		3-16
EP Curve Tool		3-17
Pencil Curve Tool		3-18
Arc Tools		3-18
Bezier Curve Tool		3-18
Tools for Creating Surfaces		3-18
Loft Tool		3-19
Planar Tool		3-21
Revolve Tool		3-22
Birail Tool		3-24
Extrude Tool		3-24
Boundary Tool		3-27
Square Tool		3-28
Bevel Tool		3-28
Bevel Plus Tool		3-29
Sweep Mesh Tool	New	3-29
Tutorial 1		3-30
Tutorial 2		3-37
Tutorial 3	New	3-41
Self-Evaluation Test		3-46
Review Questions		3-47
Exercise 1		3-48
Exercise 2		3-48
Exercise 3		3-49
Exercise 4		3-49
Exercise 5		3-49

Chapter 4: NURBS Modeling

Introduction	4-2
Working with NURBS Tools	4-2
Duplicate NURBS Patch	4-2

Project Curve on Surface 4-2
Intersect 4-3
Trim Tool 4-3
Untrim 4-4
Attach 4-4
Attach Without Moving 4-5
Align 4-6
Detach 4-6
Open/Close 4-6
Extend 4-7
Insert Isoparms 4-8
Offset 4-8
Rebuild 4-9
Reverse Direction 4-11
Sculpt Geometry Tool 4-12
Converting Objects 4-15
Converting NURBS to Polygons 4-15
Converting NURBS to Subdiv 4-16
Tutorial 1 4-17
Tutorial 2 4-22
Self-Evaluation Test 4-31
Review Questions 4-32
Exercise 1 4-33
Exercise 2 4-33

Chapter 5: UV Mapping

Introduction 5-2
UV Mapping 5-2
UV Editor 5-2
View Toolbar 5-3
UV Toolkit 5-4
Pinning 5-5
Select By Type 5-6
Soft Selection 5-6
Transform 5-6
Create 5-7
Cut and Sew 5-11
Unfold 5-12
Align and Snap 5-13
Arrange and Layout 5-13
Tutorial 1 5-15
Tutorial 2 5-19
Self-Evaluation Test 5-27
Review Questions 5-28
Exercise 1 5-29
Exercise 2 5-29

Chapter 6: Shading and Texturing

Introduction 6-2
Working in the Hypershade Window 6-2
- Create Panel 6-2
- Browser Panel 6-3
- Browser Panel Toolbar 6-3
- Work Area 6-4

Property Editor 6-6
- Common Material Properties 6-7
- Bump/Normal Mapping 6-9
- Special Effects 6-9

Exploring the Shaders 6-10
- Surface 6-10
- Standard Surface Shader 6-16

Tutorial 1 6-17
Tutorial 2 6-26
Tutorial 3 6-29
Self-Evaluation Test 6-34
Review Questions 6-34
Exercise 1 6-35
Exercise 2 6-36
Exercise 3 6-36

Chapter 7: Lights and Cameras

Introduction 7-2
Types of Lights 7-2
- Ambient Light 7-2
- Directional Light 7-4
- Point Light 7-5
- Spot Light 7-7
- Area Light 7-10
- Volume Light 7-10

Glow and Halo Effects 7-10
- Optical FX Attributes Area 7-11

Light Linking 7-14
Cameras 7-15
- Camera 7-15
- Camera and Aim 7-17
- Camera, Aim and Up 7-17
- Stereo Camera 7-18
- Multi Stereo Rig 7-18

Tutorial 1 7-18
Tutorial 2 7-21
Tutorial 3 7-24
Self-Evaluation Test 7-32

Review Questions 7-32
Exercise 1 7-33

Chapter 8: Animation

Introduction 8-2
Animation Types 8-2
- Keyframe Animation 8-2
- Effects Animation 8-2
- Nonlinear Animation 8-2
- Path Animation 8-2
- Motion Capture Animation 8-2
- Technical Animation 8-3

Animation Controls 8-3
- Playback Controls 8-3
- Animation preferences 8-4

Commonly Used Terms in Animation 8-6
- Frame Rate 8-6
- Range 8-6
- Setting Keys 8-7

Understanding Different Types of Animations 8-7
- Path Animation 8-7
- Keyframe Animation 8-8
- Nonlinear Animation 8-9

Key Menu 8-10
- Working with Keys 8-10

Visualize Menu Enhanced 8-11
Playback Menu 8-13
- Playblast 8-13
- Cached Playback 8-13
- Select Next Key 8-14
- Select Previous Key 8-14

Audio Menu 8-14
Graph Editor Enhanced 8-14
- Move Nearest Picked Key Tool 8-15
- Insert Keys Tool 8-15
- Lattice Deform Keys 8-15
- Region Tool: Scale or move keys 8-16
- Retime Tool: Scale and ripple keys 8-16
- Fit selection in all panels 8-16
- Frame playback range 8-16
- Center the view about the current time 8-16
- Auto tangents (Legacy) 8-16
- Auto tangents (Ease) 8-16
- Auto tangents (Mix) 8-16
- Auto tangents (Custom) 8-16
- Spline tangents 8-17
- Clamped tangents 8-17

Linear tangents 8-17
Flat tangents 8-18
Step tangents 8-18
Plateau tangents 8-18
Buffer curve snapshot 8-19
Swap buffer curves 8-19
Break tangents 8-20
Unify tangents 8-20
Free tangent length 8-20
Lock tangent length 8-20
Auto load Graph Editor on/off 8-20
Load Graph Editor from selection 8-20
Time snap on/off 8-20
Value snap on/off 8-20
Display curve in absolute view 8-20
Display curve in normalized view 8-21
Display curve in stacked view 8-21
Renormalize curves 8-21
Pre-infinity cycle 8-21
Pre-infinity cycle with offset 8-21
Post-infinity cycle 8-21
Post-infinity cycle with offset 8-22
Unconstrained drag 8-22
Open the Dope Sheet 8-22
Open the Trax Editor 8-22
Animation Layers 8-22
Creating an Animation Layer 8-23
Animation Layer Pane 8-25
Creating the Parent-Child Relationship in the Animation Layer Editor 8-28
Tutorial 1 8-28
Tutorial 2 8-33
Tutorial 3 8-36
Self-Evaluation Test 8-39
Review Questions 8-40
Exercise 1 8-41

Chapter 9: Rigging, Constraints, and Deformers

Introduction 9-2
Bones and Joints 9-2
Creating a Bone Structure 9-2
Types of Joints 9-3
Parent-Child Relationship 9-4
Kinematics 9-4
Deformers 9-5
Blend Shape Deformer 9-5
Curve Warp Deformer 9-5
Cluster Deformer 9-6

Delta Mush Deformer 9-6
Lattice Deformer 9-7
Wrap Deformer 9-7
ShrinkWrap Deformer 9-8
Pose Space Deformation Deformer 9-8
Soft Modification Deformer 9-8
Nonlinear Deformer 9-9
Applying Constraints 9-16
Parent Constraint 9-16
Point Constraint 9-16
Aim Constraint 9-17
Orient Constraint 9-17
Scale Constraint 9-18
Geometry Constraint 9-18
Normal Constraint 9-18
Tangent Constraint 9-19
Pole Vector Constraint 9-19
Rivet Constraint 9-19
Point On Poly Constraint 9-19
Closest Point Constraint 9-19
Adding Constraints to Animation Layers 9-20
HumanIK Character Controls 9-20
Skinning an Object 9-20
Paint Skin Weights Tool 9-21
Go to Bind Pose Tool 9-22
Maya Muscle Deformer 9-22
Muscle Objects 9-22
Types of Muscles 9-24
Muscle Creator 9-24
Set Driven Key 9-25
Tutorial 1 9-28
Tutorial 2 9-31
Tutorial 3 9-34
Self-Evaluation Test 9-40
Review Questions 9-41
Exercise 1 9-42
Exercise 2 9-42

Chapter 10: Paint Effects

Introduction 10-2
Working with the Content Browser Window 10-2
Creating Objects 10-2
Working with the Paint Effects Window 10-3
Brush Type 10-4
Global Scale 10-5
Channels 10-5
Brush Profile 10-5

Twist 10-7
Mesh 10-8
Shading 10-9
Illumination 10-10
Shadow Effects 10-11
Tutorial 1 10-13
Tutorial 2 10-22
Self-Evaluation Test 10-29
Review Questions 10-30
Exercise 1 10-31
Exercise 2 10-31
Exercise 3 10-32

Chapter 11: Rendering

Introduction 11-2
Render Setup 11-2
Maya Software Renderer 11-2
Maya Hardware Renderer 11-3
The Maya Hardware Renderer Settings 11-3
Arnold Renderer Enhanced 11-4
Working With Lights 11-4
Working with Maya Lights 11-4
Working with Arnold Lights Enhanced 11-8
Standard Shader 11-9
Base 11-9
Specular 11-9
Transmission 11-9
Bump Mapping 11-9
Emission 11-10
Matte 11-10
Tutorial 1 11-10
Tutorial 2 11-15
Tutorial 3 New 11-19
Self-Evaluation Test 11-25
Review Questions 11-25
Exercise 1 11-26
Exercise 2 11-27

Chapter 12: Particle System

Introduction 12-2
Creating Particles 12-2
Tool Settings (Particle Tool) Panel 12-2
Creating Emitters 12-3
Emitter name 12-4
Basic Emitter Attributes Area 12-4
Distance/Direction Attributes Area 12-5

Basic Emission Speed Attributes Area 12-6
Creating Goals 12-6
Colliding Particles 12-7
Resilience 12-7
Friction 12-7
Offset 12-7
Rendering Particles 12-7
Animating Particles Using Fields 12-8
Air 12-8
Drag 12-9
Gravity 12-10
Newton 12-10
Radial 12-10
Turbulence 12-11
Uniform 12-12
Vortex 12-13
Volume Axis 12-14
Creating Effects 12-14
Creating the Fire Effect 12-14
Creating the Smoke Effect 12-15
Creating the Fireworks Effect 12-16
Creating the Lightning Effect 12-17
Creating the Shatter Effect 12-18
Creating the Curve Flow Effect 12-19
Creating the Surface Flow Effect 12-19
Tutorial 1 12-20
Tutorial 2 12-27
Self-Evaluation Test 12-34
Review Questions 12-34
Exercise 1 12-35
Exercise 2 12-36
Exercise 3 12-37
Exercise 4 12-37

Chapter 13: Introduction to nParticles

Introduction 13-2
Creating nParticles 13-2
nParticle Attributes 13-2
nParticleShape1 Tab 13-3
nucleus1 Tab 13-25
Tutorial 1 13-28
Tutorial 2 13-34
Self-Evaluation Test 13-39
Review Questions 13-40
Exercise 1 13-41
Exercise 2 13-41

Chapter 14: Fluids

Introduction		14-2
Classification of Fluid Effects		14-2
Open Water Fluid Effects		14-2
Dynamic Fluid Effects		14-2
Non-Dynamic Fluid Effects		14-3
Working with Fluid Containers		14-4
Attributes of Fluid Container		14-5
Creating Fluid Containers with Emitter		14-9
Painting the Fluid Effects into Containers		14-10
Fluid Components		14-10
Ocean		14-10
Pond		14-12
Fluid Effects		14-13
Tutorial 1		14-15
Tutorial 2		14-19
Tutorial 3		14-23
Tutorial 4		14-26
Self-Evaluation Test		14-29
Review Questions		14-30
Exercise 1		14-30
Exercise 2		14-31

Chapter 15: nHair and XGen

Introduction		15-2
nHair		15-2
Creating nHair		15-2
Simulating nHair		15-4
hairSystemShape1 Tab		15-5
Painting Texture on nHair		15-12
Painting Follicle Attributes		15-12
Styling nHair		15-13
Applying Shadow to the nHair		15-13
Rendering the nHair		15-14
XGen	New	15-14
Create new description Button		15-14
Import collections or descriptions		15-18
XGen Tab		15-22
Tutorial 1		15-22
Tutorial 2		15-32
Tutorial 3	New	15-35
Self-Evaluation Test		15-42
Review Questions		15-43
Exercise 1		15-44

Chapter 16: Bifrost

Introduction 16-2
Flip Solver 16-2
Working With Bifrost Fluids 16-2
bifrostLiquidContainer1 Tab 16-3
liquidShape1 Tab 16-5
Working with Bifrost Aero 16-6
Emitters 16-6
Adding Emitter 16-6
Removing Emitter 16-8
Colliders 16-8
Adding Colliders 16-8
Removing Colliders 16-8
Caching a Simulation to Disk 16-8
Flush Scratch Cache 16-9
Compute and Cache to Disk 16-9
Working with the Bifrost Browser Window and Bifrost Graph Editor Window 16-10
Creating Bifrost Simulation Using the Bifrost Browser Window 16-10
Foam 16-13
Remove Foam 16-13
Tutorial 1 16-13
Self-Evaluation Test 16-24
Review Questions 16-24
Exercise 1 16-25

Chapter 17: Bullet Physics and Motion Graphics

Introduction 17-2
Bullet Objects 17-2
Creating Active Rigid Body 17-2
Creating Passive Rigid Body 17-8
Creating Soft Body 17-9
Rigid Body Constraint 17-10
Soft Body Anchor 17-11
Soft Body Vertex Properties 17-12
MASH Menu 17-13
MASH1_Distribute 17-15
MASH1 17-16
MASH Shelf 17-17
Tutorial 1 17-18
Tutorial 2 17-21
Self-Evaluation Test 17-28
Review Questions 17-29

Index **I-1**