

Machining and Geodesics

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Home Metal Shop Club

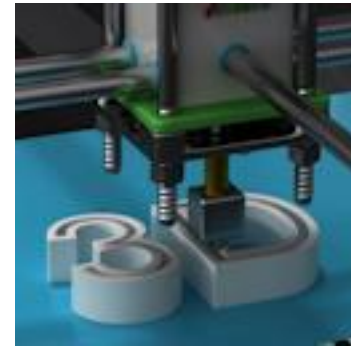
Houston, TX

Machining

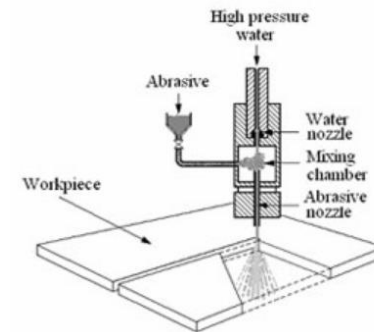
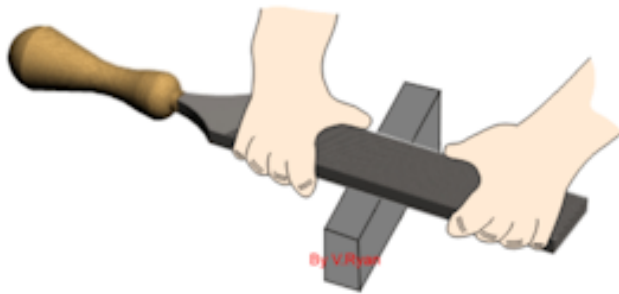
A physical process where a **volume** of material is shaped by moving a tool on a **surface** along a **path**

Types of Machining

- Additive

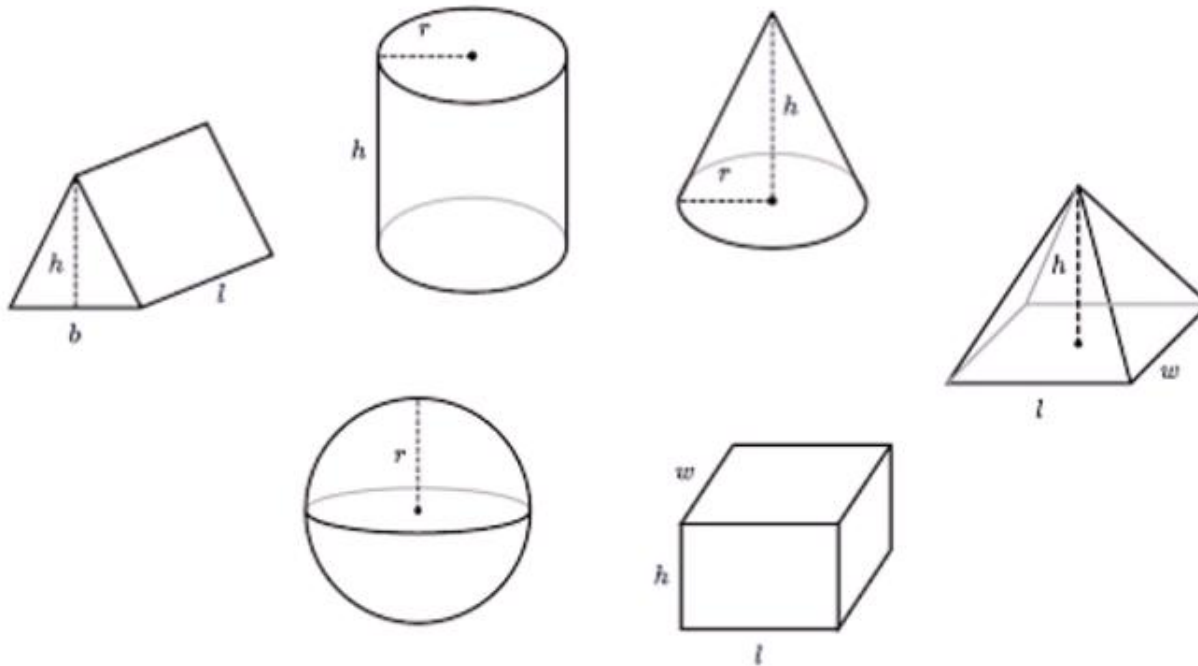


- Subtractive



Note: These processes change the volumetric shape by working on a surface.

Machining Works on Surfaces



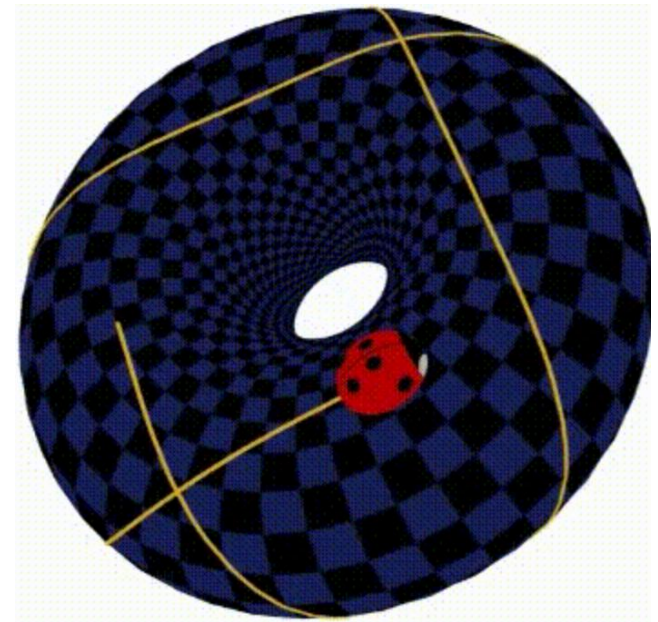
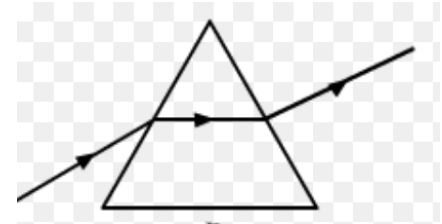
Geodesic is a Path

A geodesic is a path on a surface having some of the following properties.

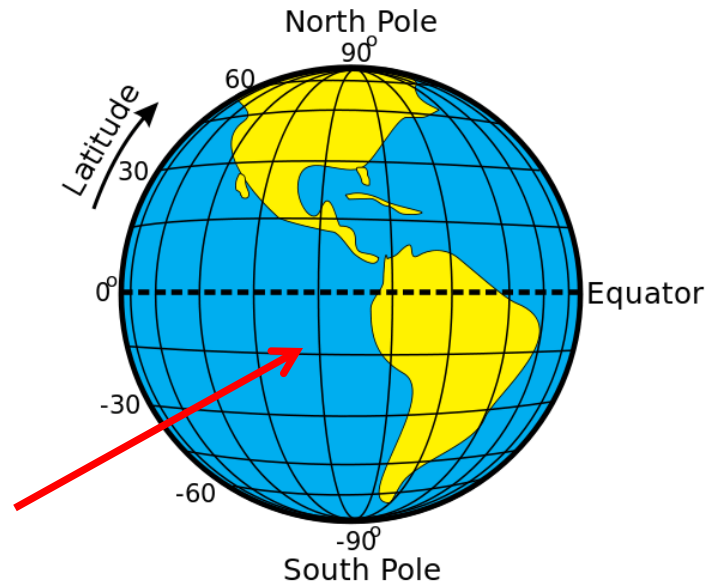
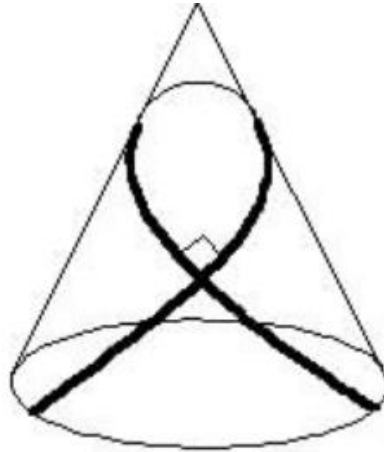
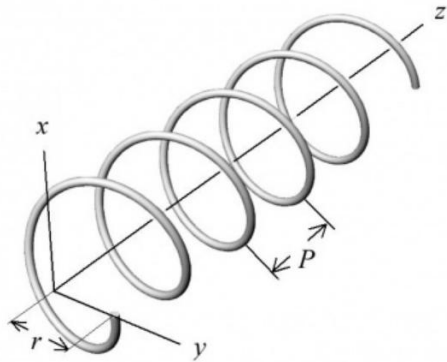
- Having the shortest distance
- Having the least travel time at a given speed
- Providing the least resistance to motion
- Cutting Force is in the direction of stock removal
- Path connecting two points devoid of steering (Natural Path)

Example: Path a wheeled vehicle takes over hilly terrain with locked steering.

Examples of Geodesic Paths

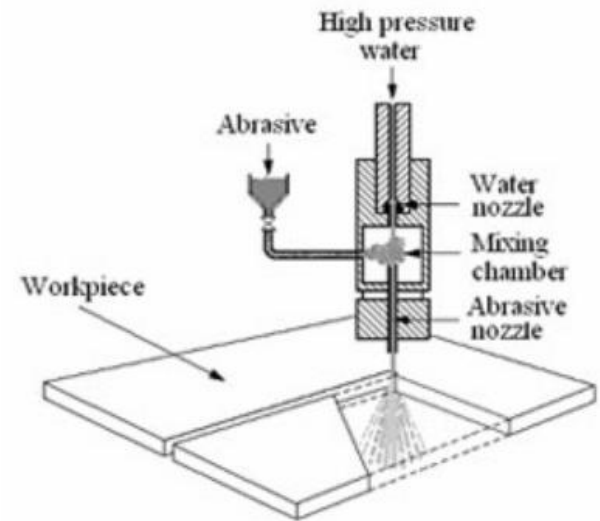
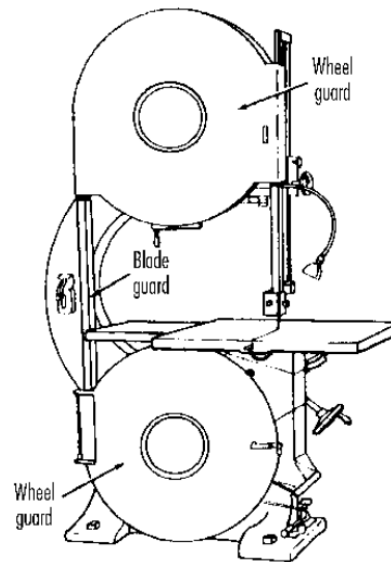
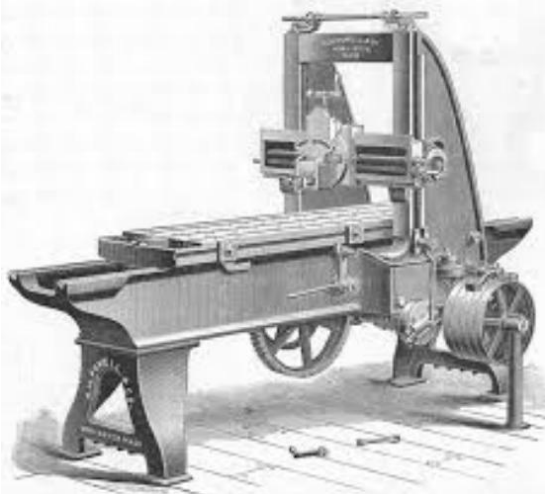
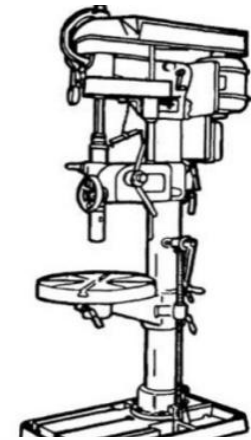
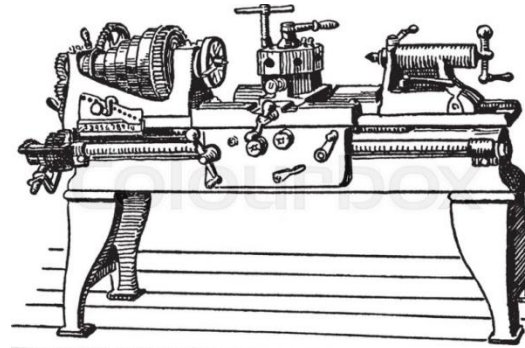
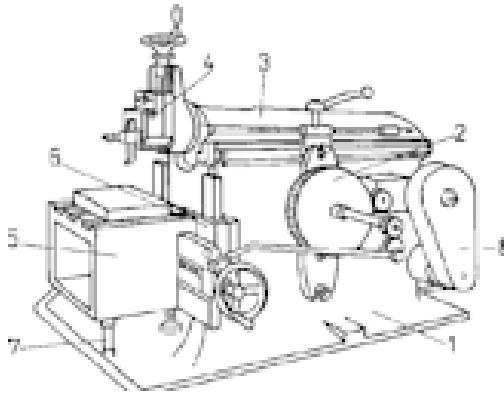


Examples of Geodesic Paths



Lines of
constant
latitude
Not
Geodesic

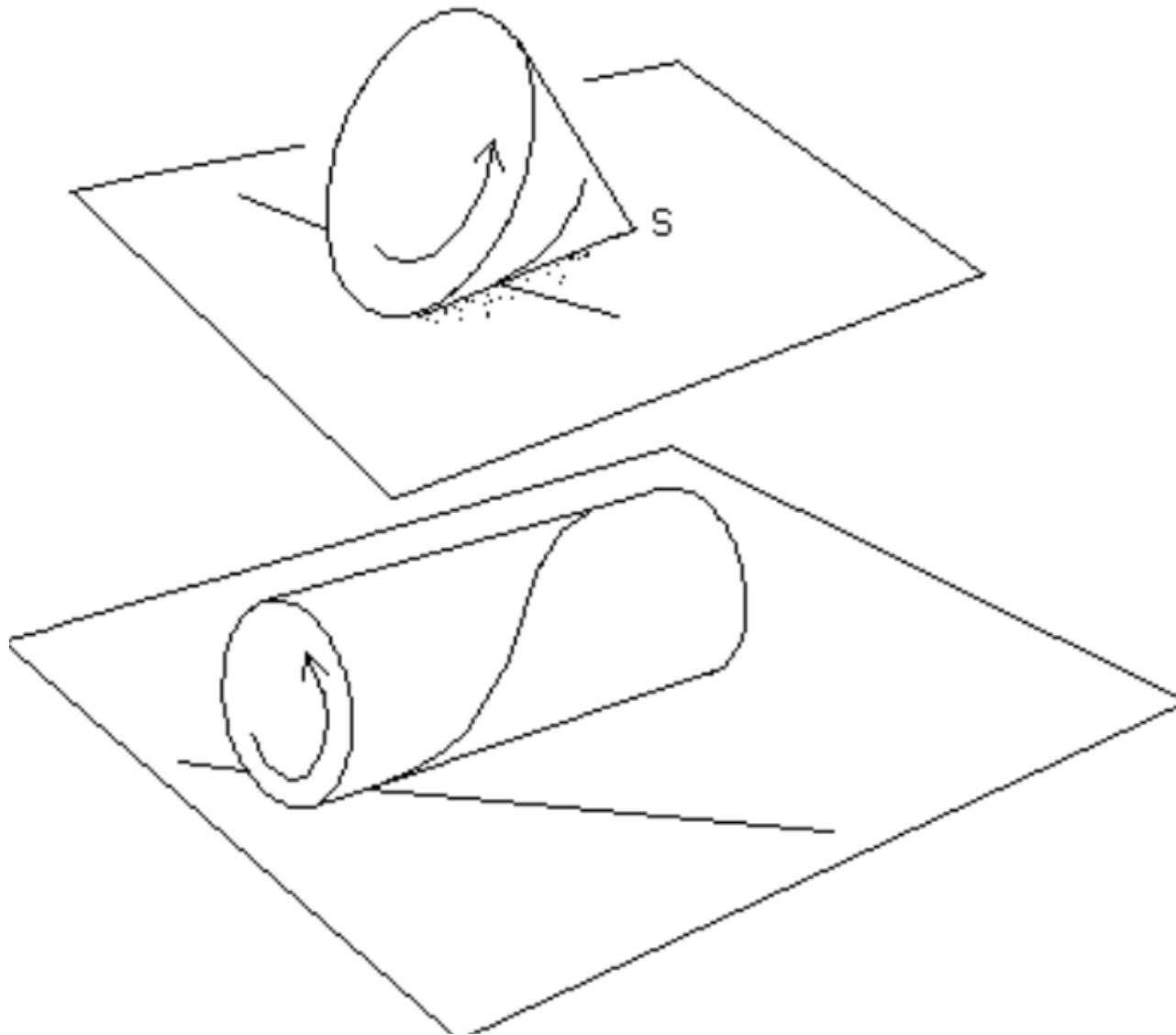
Machines That Cut on Geodesics



Advantages of Cutting on Geodesics

- Reduced wear on bearings and guides
- Minimal force required to remove a given volume of material
- Cutting tool automatically follows previous cut path (drill bit)
- Cutting force is in the direction of stock removal (not endmill)

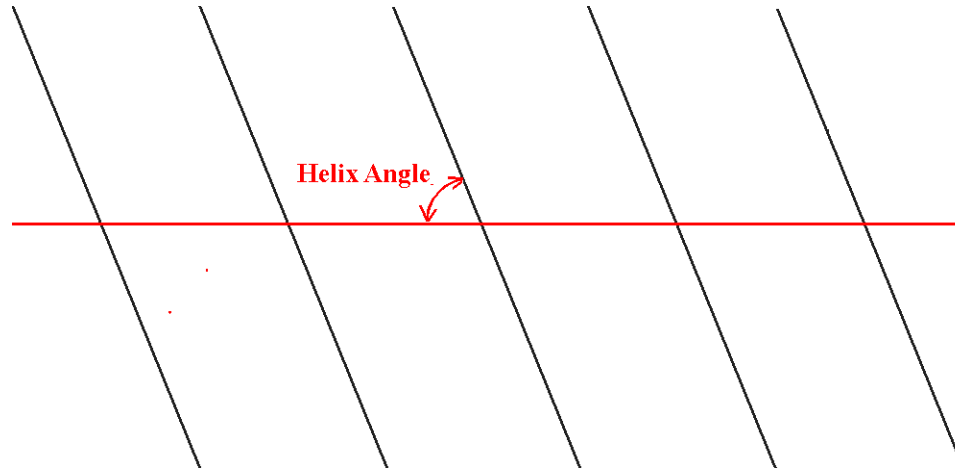
Some Curved Surfaces are Flat



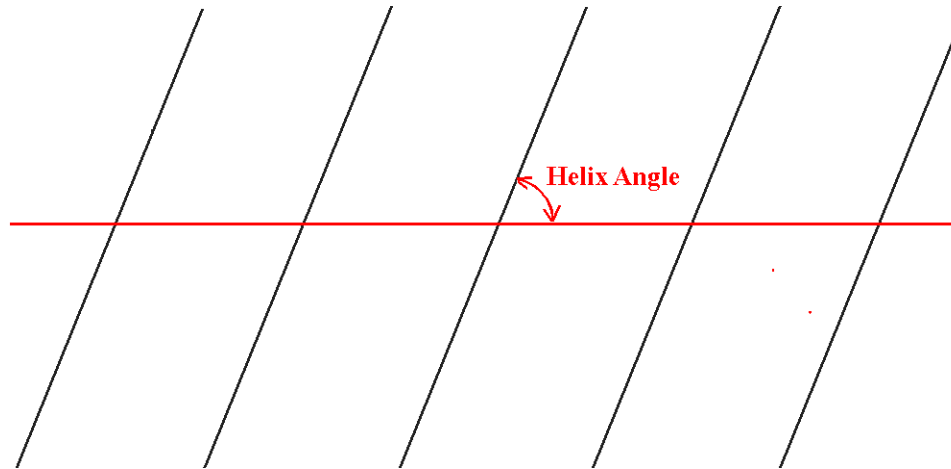
Helix on a Planar Surface



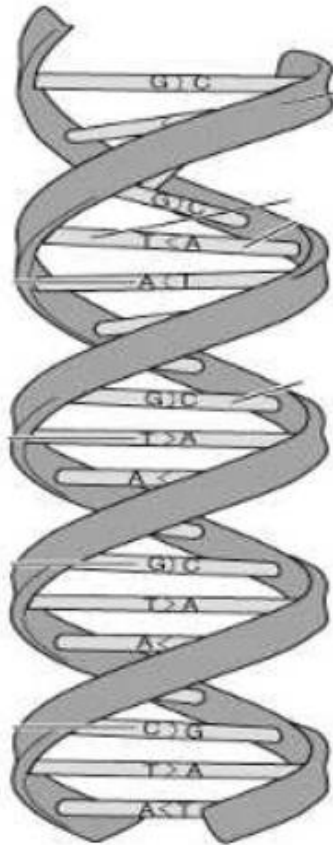
Outside Cut
Turning



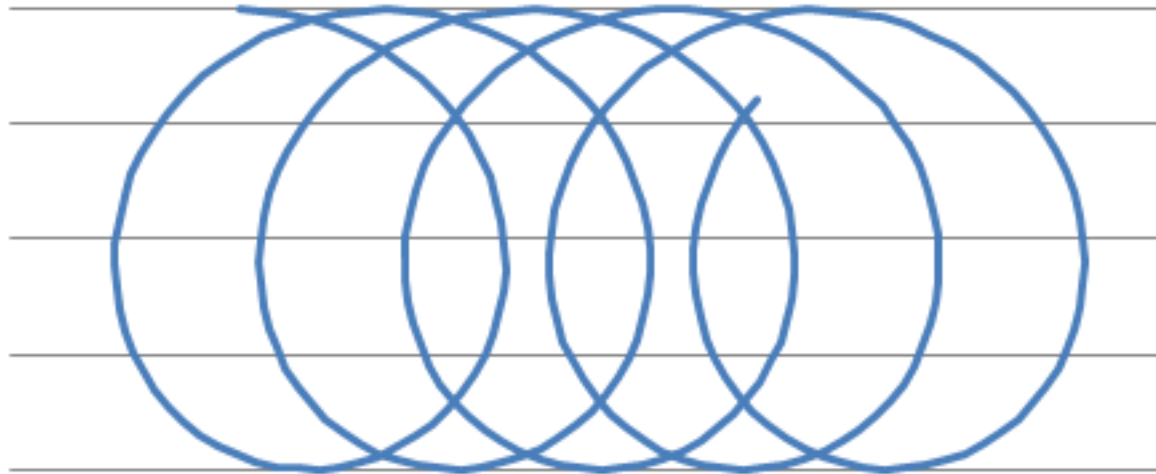
Inside Cut
Boring



Drilled Hole



Vertical Milling Machine



- Endmill does not cut along a geodesic path.
- Cutting force is often not in the direction of stock removal.

End