CLAIMS

1. A cutting insert, comprising:

an upper surface;

a lower surface;

a side surface which is connected to the upper surface and the lower surface, and comprises a first side surface and a second side surface in order; and

a cutting edge comprises

a first flat cutting edge and a first major cutting edge in order in an intersection region of the first side surface and the upper surface, and

a second flat cutting edge and a second major cutting edge in order in an intersection region of the second side surface and the upper surface, wherein

the first side surface comprises a first chamfered side surface with a curved shape, a first corner side surface with a planar shape, and a first major side surface in order,

the second side surface comprises a second chamfered side surface with a curved shape, a second corner side surface with a planar shape, and a second major side surface in order,

the intersection region of the second side surface and the upper surface comprises

a first intersection region of the second chamfered side surface and the upper surface, and

a second intersection region of the second corner side surface and the upper surface, and

the second flat cutting edge which is located from the first intersection region to the second intersection region, and has a lowermost portion in the first intersection region in a side view.

2. The cutting insert according to claim 1, wherein the second flat cutting edge has a downward convex curve with respect to a reference plane perpendicular to a central axis of the cutting insert in a side view.

3. The cutting insert according to claim 2, wherein the second flat cutting edge comprises

a curved cutting edge which is located in the first intersection region and has a downward convex curve with respect to the reference plane in a side view; and

a first inclined cutting edge which is located in the second intersection region and is inclined upward with respect to the reference plane as the first inclined cutting edge separates from the curved cutting edge in the side view.

4. The cutting insert according to claim 3, wherein a curve formed by the curved cutting edge is a spline curve.

5. The cutting insert according to claim 3 or 4, wherein the cutting edge further comprises a second inclined cutting edge which is located in the second intersection region and is connected to the first inclined cutting edge, and is inclined upward with respect to the reference plane as the second inclined cutting edge separates from the first inclined cutting edge in a side view.

6. The cutting insert according to claim 5, wherein an upward inclination angle of the second inclined cutting edge with respect to the reference plane is decreased as the second inclined cutting edge separates from the first inclined cutting edge in a side view.

7. The cutting insert according to any one of claims 2 to 6, wherein

the second side surface further comprises a second intermediate side surface located between the second corner side surface and the second major side surface,

the intersection region of the second side surface and the upper surface further comprises a third intersection region of the second intermediate side surface and the upper surface, and

the cutting edge further comprises an intermediate cutting edge which is located in the third

intersection region and has an upward convex curve with respect to the reference plane in a side view.

8. The cutting insert according to any one of claims 2 to 7,

wherein the first major cutting edge is located in an intersection region of the first major side surface and the upper surface in the intersection region of the first side surface and the upper surface, and is inclined downward with respect to the reference plane as the first major cutting edge approaches the second corner side surface in a side view.

9. The cutting insert according to claim 8, wherein the first major cutting edge is continuously inclined downward with respect to the reference plane as the first major cutting edge approaches the second corner side surface in a side view.

10. The cutting insert according to any one of claims 2 to 9, wherein the cutting edge further comprises an auxiliary major cutting edge which is located between the first major cutting edge and the second flat cutting edge, and is inclined downward with respect to the reference plane as the auxiliary major cutting edge approaches from the major cutting edge to the second flat cutting edge in a side view.

11. The cutting insert according to claim 10, wherein the auxiliary major cutting edge is continuously inclined downward with respect to the reference plane as the auxiliary major cutting edge approaches from the first major cutting edge to the second flat cutting edge in a side view.

12. The cutting insert according to claim 10 or 11, wherein a downward inclination angle of the auxiliary major cutting edge with respect to the reference plane is increased as the auxiliary major cutting edge approaches from the first major cutting edge to the second flat cutting edge in a side view.

13. A cutting tool, comprising:

a cutting insert according to any one of claims 1 to 12; and

a holder configured to attach the cutting insert thereto.

14. The cutting tool according to claim 13, wherein the cutting insert which is attached to the holder and has a negative axial rake angle with respect to a rotation axis of the holder.

15. The cutting tool according to claim 13 or 14,

wherein the second flat cutting edge is perpendicular to the rotation axis of the holder.

16. The cutting tool according to claim 13 or 14, wherein

in a side view of the holder, a straight line passing through both ends of the second flat cutting edge is perpendicular to the rotation axis of the holder, and the second flat cutting edge has a convex curve toward a front end of the holder, and

a radius of curvature of the curve is constant over an entire length of the second flat cutting edge.

17. A method of manufacturing a machined product, comprising:

rotating a cutting tool according to any one of claims 13 to 16;

bringing the cutting edge of the rotating cutting tool into contact with a workpiece; and

separating the cutting tool from the workpiece.