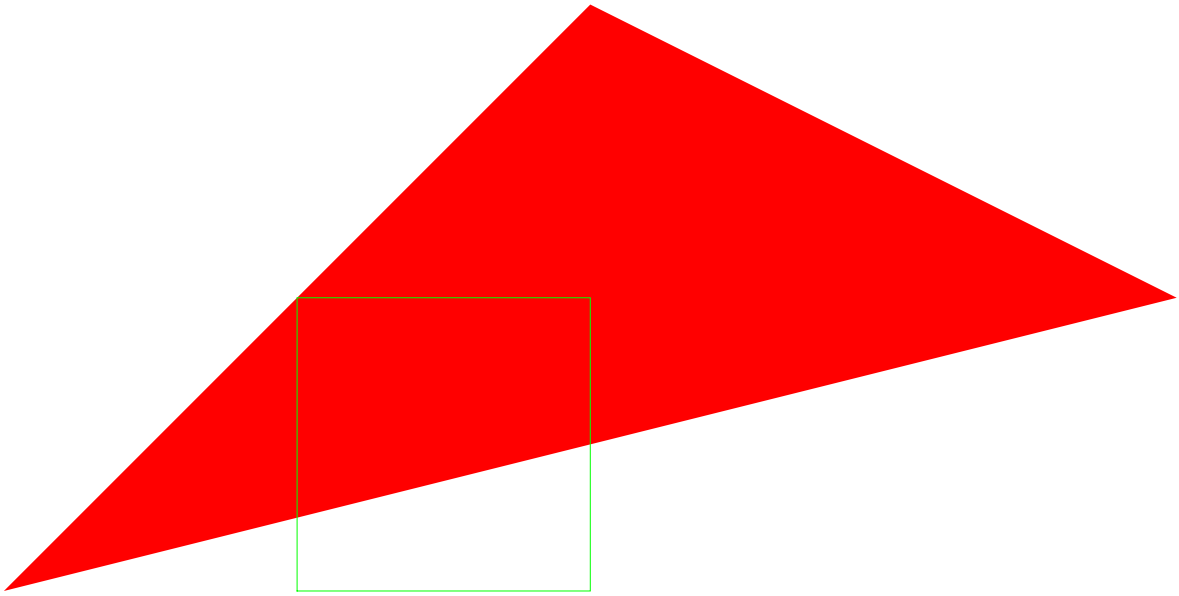
Polygon Clipping (Suther-Hodgeman Algorithm)

In[42]:=
```
clipper = {{150, 150}, {150, 200}, {200, 200}, {200, 150}};
polygonPoints = {{100, 150}, {200, 250}, {300, 200}};
```

In[44]:=
```
Graphics[{
    Red, Polygon[polygonPoints],
    Green, Line[Append[clipper, First[clipper]]]
}]
```

Out[44]=



```
Intersect[p1_, p2_, p3_, p4_] := Module[{numX, numY, den, x, y},
    den = (p1[[1]] - p2[[1]]) * (p3[[2]] - p4[[2]]) - (p1[[2]] - p2[[2]]) * (p3[[1]] - p4[[1]]);
    If[den == 0, Return[{}]];
    numX = (p1[[1]]×p2[[2]] - p1[[2]]×p2[[1]]) * (p3[[1]] - p4[[1]]) - (p1[[1]] - p2[[1]]) * (p3[[1]]×p4
    numY = (p1[[1]]×p2[[2]] - p1[[2]]×p2[[1]]) * (p3[[2]] - p4[[2]]) - (p1[[2]] - p2[[2]]) * (p3[[1]]×p4
    x = numX / den;
    y = numY / den;
    Return[{x, y}];
];
```

```
ClipEdge[polygonPoints_, clipperS_, clipperE_] := Module[{i, k, iP, kP, iPos, kPos, ne
    For[i = 1, i ≤ Length[polygonPoints], i++,
        k = Mod[i, Length[polygonPoints]] + 1;
        iP = polygonPoints[[i]];
        kP = polygonPoints[[k]];

        (* Compute positions relative to the clipping edge *)
        iPos = (clipperE[[1]] - clipperS[[1]]) * (iP[[2]] - clipperS[[2]]) - (clipperE[[2]] - cl
        kPos = (clipperE[[1]] - clipperS[[1]]) * (kP[[2]] - clipperS[[2]]) - (clipperE[[2]] - cl

        (* Case 1: Both points inside *)
        If[iPos < 0 && kPos < 0,
            AppendTo[newPolygonPoints, kP];
        ];

        (* Case 2: First point outside, second inside *)
        If[iPos ≥ 0 && kPos < 0,
            AppendTo[newPolygonPoints, Intersect[clipperS, clipperE, iP, kP]];
            AppendTo[newPolygonPoints, kP];
        ];

        (* Case 3: First point inside, second outside *)
        If[iPos < 0 && kPos ≥ 0,
            AppendTo[newPolygonPoints, Intersect[clipperS, clipperE, iP, kP]];
        ];

        (* Case 4: Both points outside → No points added *)
    ];
    Return[newPolygonPoints];
];
```

In[45]:=
```
SuthHodgClip[clipper_, polygonPoints_] := Module[{i, k, newPolygonPoints = polygonPoin
    For[i = 1, i ≤ Length[clipper], i++,
        k = Mod[i, Length[clipper]] + 1;
        newPolygonPoints = ClipEdge[newPolygonPoints, clipper[[i]], clipper[[k]]];
    ];
    Return[newPolygonPoints];
];
```

In[46]:=
```
SuthHodgClip[clipper, polygonPoints]
```

Out[46]=

$$\left\{\left\{150, \frac{325}{2}\right\}, \{150, 200\}, \{200, 200\}, \{200, 175\}\right\}$$

In[48]:=
```
Graphics[{
Red, Polygon[polygonPoints],
   Blue, Polygon[SuthHodgClip[clipper, polygonPoints]],
   Green, Line[Append[clipper, First[clipper]]]
}]
```

Out[48]=