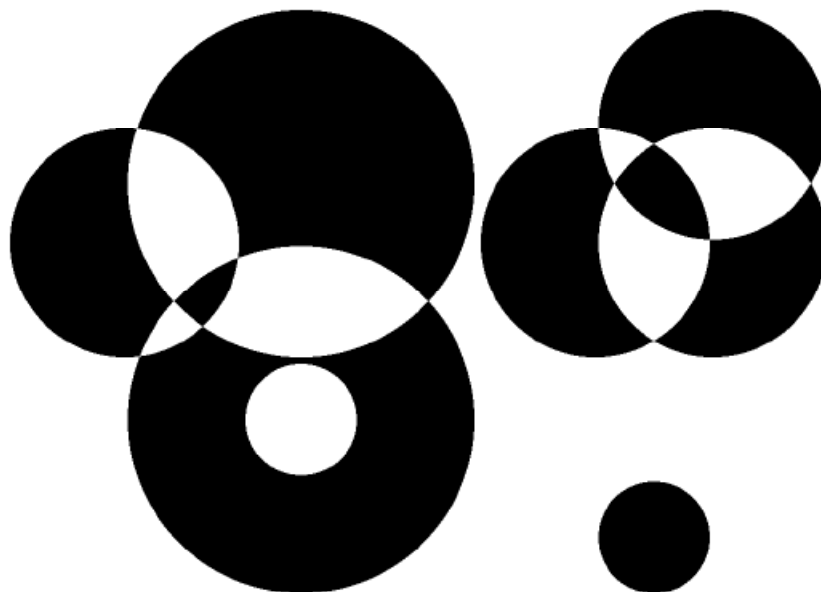**Solution to Assignment #3**
A Colouring Puzzle

1. Suppose that finitely many, possibly overlapping, circles are drawn in the plane, dividing it into regions whose borders are made up of circular arcs. Explain how the regions can be coloured using white and black so that no two regions sharing a common border have the same colour, and explain why your method works. *[9]*

Note. Just in case: regions touching at only finitely many points do not share a border.

Solution. Colour each region white if it is inside an even number of circles and black if it is inside an odd number of circles. Since one of any two regions sharing a common border must be inside one more circle than the other, one of any two regions sharing a common border is inside an even number of circles and the other is inside an odd number of circles, so they get different colours. ∎

2. Draw a picture explaining why this could be a Mickey Mourse problem. *[1]*

Solution. With apologies to Walt Disney: