

## Lesson 20 — Logic

### Problem 1 (5 points)

State the contrapositive of "If I shower, then I don't smell bad."

### Problem 2 (5 points)

Which of the following is the contrapositive of the Four Color Theorem "If  $G$  is a planar graph, then the vertices of  $G$  can be colored by  $\leq 4$  colors with adjacent vertices of different colors."

- (a) If  $G$  is not a planar graph, then the vertices of  $G$  cannot be colored by  $\leq 4$  colors with adjacent vertices of different colors.
- (b) If the vertices of  $G$  can be colored by  $\leq 4$  colors with adjacent vertices of different colors, then  $G$  is a planar graph.
- (c) If the vertices of  $G$  cannot be colored by  $\leq 4$  colors with adjacent vertices of different colors, then  $G$  is not a planar graph.

### Problem 3 (5 points)

Consider the statement "If Oscar eats Chinese food, then he drinks milk."

- (a) Write the contrapositive of the above statement.
- (b) If the contrapositive is false, what would that tell you?
- (c) Suppose that the original statement is true, and that Oscar drinks milk. Can you conclude anything about whether he eats Chinese food? Explain.
- (d) Suppose the original statement is true, and that Oscar does not drink milk. Can you conclude anything about his eating Chinese food? Explain.