

# Practice Final Answer Key

Surfaces and Knots, Dave Bayer, May 13, 2002

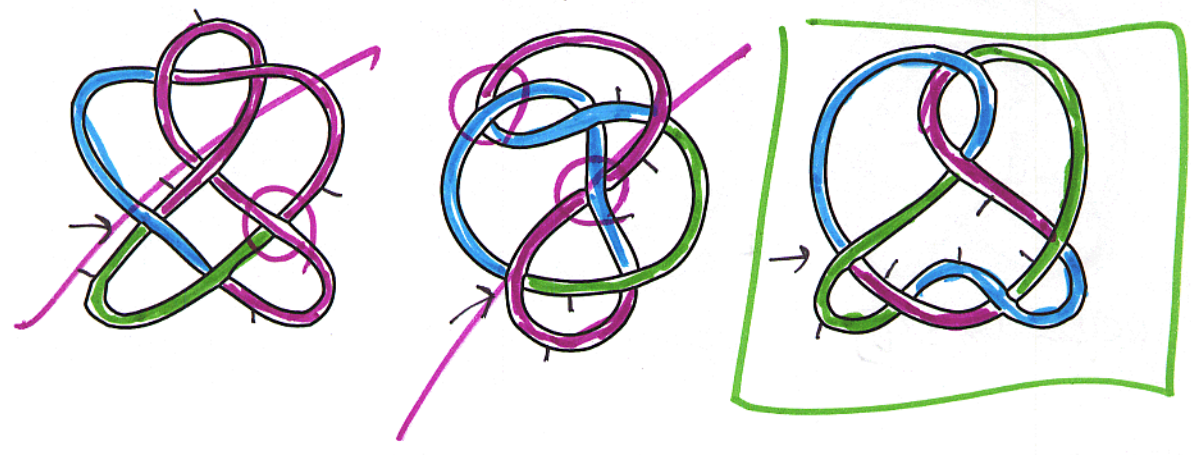
Name: \_\_\_\_\_ School: \_\_\_\_\_

[1]	[2]	[3]	[4]	[5]	TOTAL

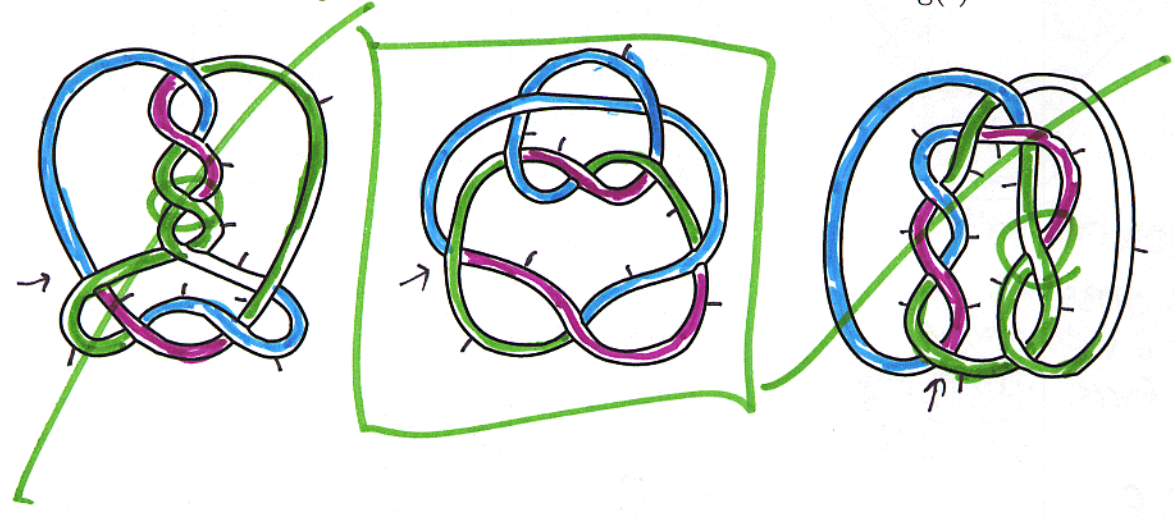
You may use scratch paper, but only this sheet will be graded; please present all answers on this sheet.

In addition to this final, you may optionally retake midterm 2. If you retake midterm 2, your score for midterm 2 will be the average of your scores on both tries, even if your score goes down. Do not retake midterm 2 unless you accept this risk.

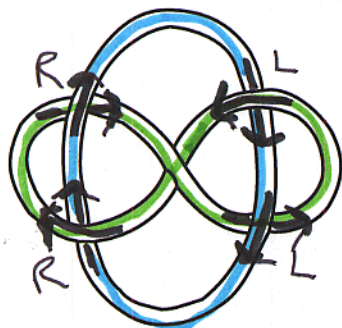
[1] Which of the following knots are 3-colorable? Show the 3-coloring(s).



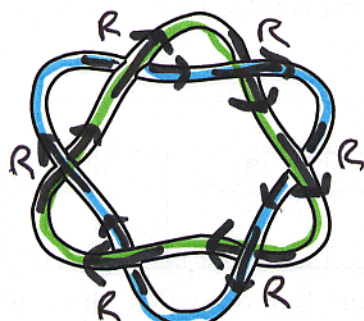
[2] Which of the following knots are 3-colorable? Show the 3-coloring(s).



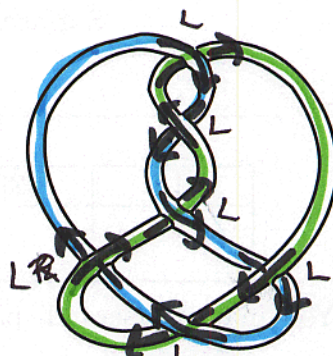
[3] Computing the linking number between the components of each of the following links.



RR|LL  $\frac{0}{2} = \boxed{0}$

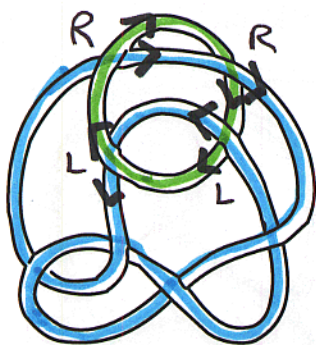


RRRR|RRRR  $\frac{6}{2} = \boxed{3}$

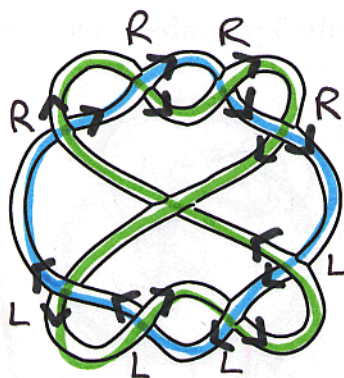


LLLL|LLLL  $\frac{6}{2} = \boxed{3}$

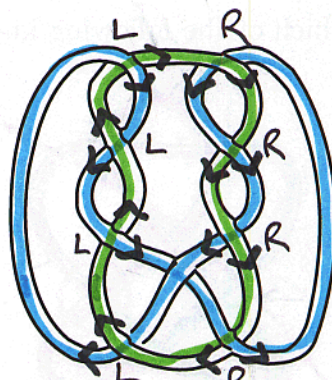
[4] Computing the linking number between the components of each of the following links.



RR|LL  $\frac{0}{2} = \boxed{0}$

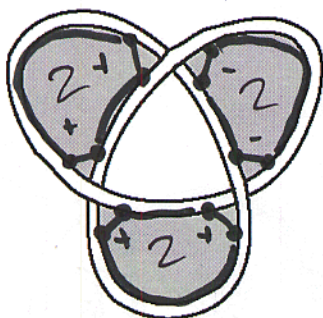


RRRR|LLLL  $\frac{0}{2} = \boxed{0}$



LLLL|RRRR  $\frac{0}{2} = \boxed{0}$

[5] Classify the spanning surface shown for each of the following knots.



non-orientable  
 3 crossings  
 = 6 vertices, 3 edges  
 + 3 faces,  $2+2+2$  edges  
 $\frac{6}{2} = 3$

+v	6
-e	9
+f	3
$\chi$	0

Möbius band



orientable  
 5 crossings  
 = 10 vertices, 5 edges  
 + 4 faces,  $3+3+2+2$  edges  
 $\frac{10}{2} = 5$

+v	10
-e	15
+f	4
$\chi$	-1

punctured torus



non-orientable  
 8 crossings  
 = 8 vertices, 16 vertices, 8 edges  
 + 3 faces,  $5+7+4$  edges  
 $\frac{16}{2} = 8$

+v	16
-e	24
+f	3
$\chi$	-5