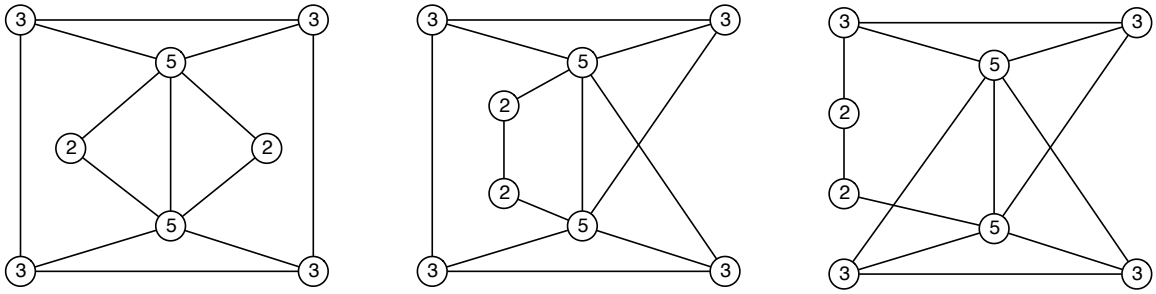
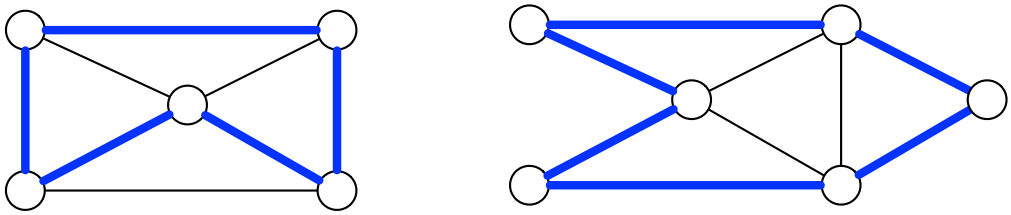
Solutions to Spring, 2008 final exam practice problems

(1) Here are three different solutions, with the vertex degree shown inside the vertex:



(2) See handout.
(3) See first exam.
(4) Here are pigeonhole assignments which help explain each property:
(a) {1,–1}, {2,–2}, {4,–4}, {8,–8}, {16,–16}, {32,–32}
If you choose seven numbers, at least two will fall in one of these six pigeonholes, and those two will have sum of 0.
(b) (b) {1,–1}, {2,–2}, {4,–4}, {8,–8}, {16,–16}, {32,–32}
The same assignments prove this property also!
(c) {1,2}, {4,8}, {16,32}, {–1,–2}, {–4,–8}, {–16,–32}
(d) {1,–32}, {2,–16}, {4,–8}, {–1,32}, {–2,16}, {–4,8}
(e) {1,–1}, {2,–2}, {4,–4}, {8,–8}, {16,–16}, {32,–32}
(f) in (a), (b), (d), and (e) you can use 1,2,4,8,16, and 32; in (c) use 1,–1.4,–4,16,–16

(5) We didn't do this field trip, sorry!!
(6) See the pictures in the text
(7) 180 degree rotation of p gives d
Reflection of p gives q
Translation of p gives another p
Glide reflection of p gives b
(8) This was also like the exam problem.
(9) See the first exam
(10) We did the string figures, but not the flea market problem!
(11) Both of the graphs are actually Hamiltonian; Hamiltonian cycles are shown here in blue.

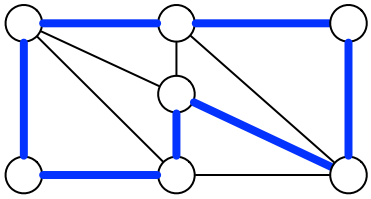


The one on the left has no Euler cycle since 4 of the vertices have odd degree. The graph on the right has an Euler cycle since all vertices have even degree.
(12) See the exam or homework problems.
(13) Poinsot stars are also called star polygons, which we worked on.
(14)-(16) Like classwork, homework, handouts.

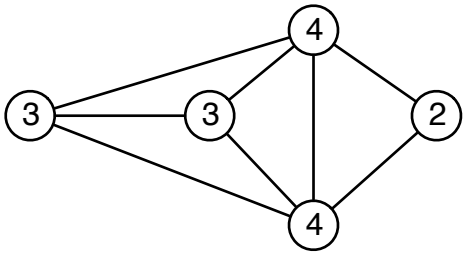
See next page

Spring 2009 Final Exam study guide

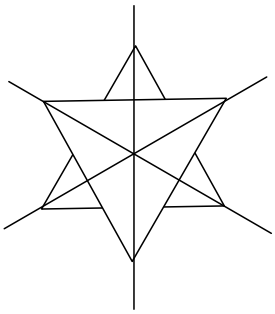
(1) Many varying answers.
(2) Below is a Hamiltonian cycle in this graph. An example of an Eulerian cycle is ABCFBGFEGAEDA



(3)



(4) There are three lines of reflection symmetry shown. The 3 lines intersect in a point of 20 degree rotation symmetry.



(5) We didn't have problems like this, don't worry.
(6) $100 \equiv 1 \pmod 3$, so box (100,1) is a triangle and column 100 is just like column 1
$30 \equiv 0 \pmod 3$, so box (100,30) is like box (1,0) or box (1,3) and is a square.
$50 \equiv 2 \pmod 3$, so box (100,50) is like box (1,2) and is a circle.

(7) (a) Let x be 3. (b) Let x be 12, 6, 4, 3, or 2 (all divisors of 35 – 23).
(c)

	0	**1**	**2**	**3**
0	0	1	2	3
1	1	2	3	0
2	2	3	0	1
3	3	0	1	2

(8) Fractal dimension is log(5)/log(3)
(9) $F_2 + F_4 + F_6 + F_8 + \ldots + F_{2n} = F_{2n+1} - 1$
(10) (a) What do you think?
(11) Skip