

Exam 2 covers the material from section 3.2 through Chapter 6, inclusive. There's enough to test you on that we'll wait until later to test you on similarity and circle inversions. As with the first midterm, we'll use the first portion of class for the exam, take a break, and then come back to cover a bit of new material.

As far as the type of problem, you can expect a mixture similar to the first exam. A few will be very similar to homework problems and/or propositions or theorems which we devoted a lot of class time to. Somewhere on the exam you'll be asked to prove something you've never seen before – say, given some information about a triangle or quadrilateral, prove that two given points are equal, etc. *Don't freak out when you read this problem and think "I've never seen this!"* That's the point: to check if you understand the definitions and techniques well enough to apply them in a slightly different setting.

As before, the exam is closed book, closed notes, closed calculator, etc. Don't trivialize a problem, meaning if I ask you to prove a result from class, you shouldn't just cite the theorem.

A few words of advice, by chapter:

Chapter 3: We spent a *lot* of time on isometries, so you can expect them to be important on the exam. You should be familiar with all of the isometries in the classification Theorem 3.51 and how to represent them with formulas. We spent a great deal of time in class developing the matrix form of a formula for a reflection, so you can expect to see it on the exam. I'd recommend using my approach (see the [Reflection Example](#) and [HW #3 Solutions](#)) instead of the book's in Section 3.8 unless you're *really* comfortable with what you're doing. [There's nothing wrong with the book's approach per se, but you'll be on your own because we didn't cover reflections that way.] You should also have some awareness of what happens when you do one isometry followed by another – especially two reflections across mirrors which are parallel or intersect, since that was stressed in class and on the homework.

I'll give you the matrices $R_\theta = \begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix}$ and $F_\theta = \begin{bmatrix} \cos(2\theta) & \sin(2\theta) \\ \sin(2\theta) & -\cos(2\theta) \end{bmatrix}$, but you have to know what do with them.

Suggested review problems: any of the HW or examples we did in class, plus 3.14, 3.15, 3.31, 3.38

Chapter 4: Be comfortable converting to and from barycentric coordinates, and know where points whose barycentric coordinates are (for example) $(+, +, -)^\Delta$ or $(0, +, +)^\Delta$ are in the plane, relative to A , B and C . Congruence and triangle congruence theorems are central to everything that follows in the textbook, so be comfortable with those. The formula for isometry in Theorem 4.21 isn't so awful, and leads directly to SSS and SAS congruence. But I wouldn't expect you to be able to regurgitate the proof to Theorem 4.21.

Suggested review problems: any of the HW, plus 4.11

Chapter 5: In addition to the basic definitions in the chapter, you should know what medians, altitudes, perpendicular bisectors and angle bisectors are, and where they meet. There are various "concurrency" theorems and formulas. Proving the perpendicular bisectors are concurrent (and explaining why the circumcenter is the center of the circumcircle) is pretty reasonable for an exam.

Same for the angle bisectors and incenter. Proving the medians are concurrent is a cute little application of parametric lines, but I'm not so interested in whether you can memorize a bunch of expressions with $1/2$'s, $1/3$'s and $2/3$'s. I'd probably be more interested in applications of the median, like the proof we did in class that the medians split a triangle into six smaller (not necessarily congruent) triangles which all have area $1/6$ that of the original triangle.

Under no circumstances should you start memorizing the formulas for barycentric coordinates of the feet of the altitudes, the orthocenter, etc. Don't memorize formulas for the circumradius, or inradius. We can be glad somebody has figured those out, but I have other things I can test you on.

Suggested review problems: any of the HW, plus 5.26 (which we did in class), 5.34

Chapter 6: Major results like Proposition 6.4 are important; results like Theorem 6.5 or Propositions 6.6 and 6.7 are useful, but rather than memorizing them you could aim to become familiar enough with the methods of this chapter so you could prove them if needed. One suggestion I can make is that you shouldn't be afraid of "vector methods" – i.e. doing calculations involving the vertices of a quadrangle or the vectors between them. [See the proofs we did in class involving parts (iv) and (vi) of Proposition 6.4, for example. Or prove Theorem 5.4.] Because we're switching the homework schedule around, you won't have homework problems on this chapter before the exam, so you can be reasonably sure I'll stick close to the kinds of things we've done in class.

Suggested review problems: 6.21, 6.24, 6.25, 6.26, 6.29

I've included a lot of possible review problems. The goal is not for you to do every single one of them and memorize their solutions. Pick and choose as appropriate; if you're very confident with chapter 5 you don't need to spend much time there. If you're not as sure of chapter 6 you might want to look at a few more of those review problems. As always, please feel free to email me with questions.