I attended Miles’ Math 3C class on Monday November 8, 2010. Lecture enrollment was 38 students, and by my rough count, approximately 33 students were present. Miles started class on time, and his easy rapport with the class was evident within the first two minutes (he and the students have inside jokes, most of which seem to involve birds.). Miles’ voice is clear and loud enough to be heard from all corners of the room, and his handwriting is very neat and easily read from the back of the classroom. His general style is engaging, friendly, and confident without being intimidating; he is charismatic and his sense of humor really shines through, but his jokes are well placed and in no way distracting. He welcomes and responds carefully and thoughtfully to students’ questions, and he frequently asks questions of his students to elicit their participation in the lecture and to determine their level of understanding. During the lecture, his students asked him lots of questions and were clearly comfortable doing so. Miles’ pace was appropriate; the students appeared to be keeping up with him.

The main topic of Miles’ lecture was the inverse trig functions. (In the last few minutes of class, he introduced the right triangle definitions of the trig functions, but that discussion was to be continued during the next lecture.) The class had studied the arcsine function in the previous lecture, so Miles began with a discussion of the arccosine function. He started by asking the class if the cosine function is one-to-one, and the class used the horizontal line test to determine that it is not. The class agreed that the cosine function is invertible on the restricted domain $[0, \pi]$ and Miles made connections with earlier material in the course to sketch the graph of the inverse via a reflection over the line $y = x$. He asked the students to read the domain and range of the arccosine function off of its graph, and they readily answered his questions. (Here it would have been nice to connect the domain and range to the definition, e.g. ask the students why 2 is not in the domain.) Miles then did the example $\arccos(\sqrt{3}/2)$ and then called on a student to do the example $\arccos(-\sqrt{2}/2)$. The class then moved on to a discussion of the arctangent function, which paralleled that of the arccosine function. Here again the discussion was extremely interactive, with Miles calling on students by name to evaluate the arctangent at simple inputs and other students interjecting with their questions. Miles then defined the inverses of the remaining trig functions and did one simple example for each of the three. Miles then presented the class with a series of three more complicated well-chosen examples: $\arcsin(\sin(\pi/2))$, $\arcsin(\sin(3\pi/4))$, and $\cos(1/2\sin^{-1}(\sqrt{3}/2))$. He clearly explained how to evaluate the first example, instructing the students to proceed step by step, and then used the next two examples to check the students’ level of comprehension. After the third example, the students asked him to make up one more, and he happily provided them with another example.

My only suggestions regarding Miles’ lecture are as follows:
• Although Miles’ boardwork is very clear, a few of the examples on the board had the tendency to bleed into one another. Miles may consider structuring his boardwork more carefully, e.g. starting new examples on the board with EXAMPLE: or PROBLEM: so that the students will have an easier time using their class notes to study.

• There were a couple of missed opportunities to emphasize the meaning of concepts. When Miles asked the class if the cosine and tangent functions are one-to-one, he appealed to the horizontal line test, and it would have been a perfect place to revisit why the horizontal line tests can be used to check if a function is one-to-one, i.e. what does it mean for a function to be one-to-one? Similarly, in working the examples with the inverse trig functions, several students correctly evaluated the these functions, e.g. making claims such as \( \arccos\left(-\frac{\sqrt{2}}{2}\right) = \frac{3}{4}\pi \), yet seemed unsure if their answers were correct. I suggested to Miles that he repeatedly ask the class how we know if this statement is correct, i.e. what does it mean to say that \( \arccos\left(-\frac{\sqrt{2}}{2}\right) = \frac{3}{4}\pi \)?

In summary, I was quite impressed during my observation. Miles gave an effective lecture. He interacts very well with his students and displays a good grasp of the mechanics of teaching.