Greetings. [No, this isn't a notice to report for induction into the armed forces!] It is a list of suggestions for homework problems to do so as to build and maintain skill. Finger-proficiency is important, for it frees up the mind to think about that part of mathematics that requires thought rather than computation. It also is part of building intuition.

p 399 # 88, 90.

p 400 # 92.

p 407 # 51, 64, 78. In 78, as well as solving by interpretation, continue after the first substitution (which you will readily see ought to be $t = x^2$) by substituting $t = \sin(\theta)$. This will get you a trigonometric integral which also looks hard, but a trig identity relating squares of sine and cosine to double angles ought to do the trick.

p 407 # 86.

pp 427-428 # 3, 25, 35, 51 [the little icon next to 51 says that you will be needing to use Maple.]

Find the area bounded by the lines from the origin to the curve $x^2 - y^2 = 1$ at $(\sqrt{2}, \pm 1)$.

Now, slightly off topic: One of you asked after class how an exact answer might be found to the question of what values of x have $\sin\sin\sin\sin x = \cos\cos\cos\cos x$. Maple can provide an excellent hint (really, an answer). Just plot the two functions, or plot their difference, over any interval of length 2π. It will appear that there is no intersection. But wait! How do we know that the plot is not missing something? Maple plots work by evaluating the function given them at a finite number of values, and then connecting the dots. Could the function take a violent zig up and back down, in between two such dots?

If so, it would have to have a large derivative at some point. So, this gets you thinking about the derivative of $\sin\sin\sin\sin x$, say. If you can come up with a reason why this is always small, you will have the theoretical side of the proof to go with the evidence of your eyes.

Finally, how about a simpler proof? Do we really need a hundred dots, and all the arithmetic that went into them? Probably not. Here's some starting ideas: $\sin x \leq 1$ for all x. Thus, $\sin\sin x \leq \sin 1 < \sin(\pi/3) = \sqrt{3}/2$. And so, $\sin\sin\sin x < \sin(\sqrt{3}/2)$ and so on. Similarly, there ought to be a series of simple inequalities for $\cos\cos\cos\cos x$, but in the other direction.

If these work out, the upper bound for the nested sines will come in less than the lower bound for the nested cosines.