Assignment 6 Math 103 Fall 2008
Due: Class Monday 1 Dec

Reading

- *Patterns in Patterns*: Ch. 2

Writing

Using *concise, clear sentences*, incorporate symbols, calculations, and illustrations into the text. Have an audience in mind. *Explain* what you're doing and why you're doing it.

1) Write-up for the coil: **2.6**
2) Write-up for the golden spiral: **2.9**

In-class presentations

1) **2.6:** 1, 2 (group)
2) **Opportunities 2.10:** 5 (group)
3) **Another spiral.** (See below.) 1, 2 (group)
4) **Another spiral.** (See below.) 3, 4 (group)
5) **Circle game.** (See below.)(group)

Another spiral. Suppose instead of eight equally spaced radial lines, we used 12 equally spaced radial lines to create a spiral. On "dodecapus" paper, use the same process as the book describes to create a spiral. As before, label the spiral points $\ldots, P_{-2}, P_{-1}, P_0, P_1, P_2, \ldots$ and call the distances from the center (where the lines intersect) $\ldots, d_{-2}, d_{-1}, d_0, d_1, d_2, \ldots$.

1) Express d_1 in terms of d_0.
2) Develop a formula for the distance d_n in terms of d_0. Compare the result to the one for the octopus spiral.
3) Choose the P_0 ray to be a reference ray. For five rays, give the correspondence between distance d_n and the angle formed by the P_n ray and the P_0 ray.
4) Call the radial distance r and the angle t. Express r in terms of t. Compare the result to the one for the octopus spiral.

Circle game. Instead of making a 90° angle when "leaving" a ray, we can connect to the next ray with a "spiral segment" that forms an angle with the ray where you are that's different from 90°. Once again, we use the *same angle*—always measured on the same side of the ray—at each step of the process.

For the octopus spiral, what choice of angle—measured on the side of the spiral segment that's toward the center—will cause the path to close up—that is, return to where it began? If we use 16 equally space radial lines, what angle will cause the path to return to the starting point? What angle will close up the path if we use 32 such radial lines? What happens to this "closing-up" angle if we continue to double the number of radial lines?

Beyond the classroom

- Find other ways of creating spirals. Also, look for spirals in the world around you—in nature, tools, art, toys. In the kitchen sink. When you find them, see if you can make some sense out them. Are they snail-like, coil-like, something else?
- Find "families" of spirals in nature. Do they exhibit "Fibonacci behavior?"