Last name ______________________

First name ______________________

LARSON—MATH 350—CLASSROOM WORKSHEET 16
Fibonacci Numbers!

Review

- How is the *Fibonacci sequence* F_n $(n \geq 0)$ defined?
- What is the *Golden Ratio* ϕ?

The terms of the Fibonacci sequence are given by the formula:

$$F_n = \frac{1}{\sqrt{5}}[(\frac{1+\sqrt{5}}{2})^n - (\frac{1-\sqrt{5}}{2})^n].$$

1. Use the formula to find F_0.

2. Use the formula to find F_1.

3. Use the formula to find F_2.

4. What happens to $(\frac{1-\sqrt{5}}{2})^n$ as $n \to \infty$?

5. So find an approximation for F_n (actually the limit as $n \to \infty$).

6. Then find an approximation for $\frac{F_{n+1}}{F_n}$.

So F_n is a geometric series (well, almost, in the limit!).

7. Check that the geometric series $G_n = c\phi^n$ $(n \geq 0)$ is "Fibonacci like" in the sense that $G_n = G_{n-1} + G_{n-2}$.

8. Let $\bar{\phi} = \frac{1-\sqrt{5}}{2}$. Check that the geometric series $\bar{G_n} = c\bar{\phi}^n$ $(n \in \mathbb{Z}^{\geq 0},\ c \in \mathbb{R}^{\geq 0})$ is "Fibonacci like" in the sense that $\bar{G_n} = \overline{G_{n-1}} + \overline{G_{n-2}}$.