1. **DoNow:** The Random Decimal
   (a) Have each person in your group think of a random integer from 0 through 9. Let a_1 be $0.wxyz$ where w, x, y and z are your numbers. For example, if you came up with 2, 4, 1, and 8, then you would write $a_1 = 0.2418$.
   (b) Have each person in your group think of a new integer, and add those integers to the end of a_1 to form a_2. For example, if you already had $a_1 = 0.2418$, you might come up with $a_2 = 0.24185299$. Continue the process to form a_3, a_4 and a_5.
   (c) If you continued this process infinitely many times, you would have an infinite sequence $\{a_n\}$. Does this sequence converge, diverge, or is it impossible to tell? Why?

2. Recall we decided that the differential equation $\frac{dy}{dt} = -k(y-20)$ could be used to model the temperature of a cup of hot coffee as it cools where room temperature is 20 degrees. Solve this DE when $y(0) = 100$ degrees. Be sure to check your answer.

3. A Fibonacci sequence is defined recursively as $f_1 = 1, f_2 = 1, f_n = f_{n-1} + f_{n-2}$.
   (a) Write out the first 7 terms of the sequence.
   (b) Now consider the sequence $\{r_k\}$ where $r_k = \frac{f_{k+1}}{f_k}$. Write out the first 7 terms of this sequence.
   (c) Should r_n converge as $n \to \infty$? If so, find the limit. If not, explain how you know.

4. If possible, we want to find the value of $\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+...}}}}$
   (a) Consider the recursive sequence $a_0 = 0$, $a_{n+1} = \sqrt{1+a_n}$. Compute the next five terms a_1, a_2, a_3, a_4, and a_5. (You can use a calculator.)
   (b) Were any of the values of a_k in the part (a) greater than 2?
   (c) Explain how you can tell that $a_n < 2$ for all n.
   (d) How do you know that $a_{n+1} > a_n$?
   (e) Since $\{a_n\}$ is increasing and bounded above by 2, the Monotone Sequence Theorem says that $\{a_n\}$ converges. If $\lim_{n\to\infty} a_n = a$, show that $a = \sqrt{1+a}$.
   (f) What is the value of $\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+\cdots}}}}$?

1. **DoNow:** The Random Decimal
   (a) Have each person in your group think of a random integer from 0 through 9. Let a_1 be $0.wxyz$ where w, x, y and z are your numbers. For example, if you came up with 2, 4, 1, and 8, then you would write $a_1 = 0.2418$.
   (b) Have each person in your group think of a new integer, and add those integers to the end of a_1 to form a_2. For example, if you already had $a_1 = 0.2418$, you might come up with $a_2 = 0.24185299$. Continue the process to form a_3, a_4 and a_5.
   (c) If you continued this process infinitely many times, you would have an infinite sequence $\{a_n\}$. Does this sequence converge, diverge, or is it impossible to tell? Why?

2. Recall we decided that the differential equation $\frac{dy}{dt} = -k(y-20)$ could be used to model the temperature of a cup of hot coffee as it cools where room temperature is 20 degrees. Solve this DE when $y(0) = 100$ degrees. Be sure to check your answer.

3. A Fibonacci sequence is defined recursively as $f_1 = 1, f_2 = 1, f_n = f_{n-1} + f_{n-2}$.
   (a) Write out the first 7 terms of the sequence.
   (b) Now consider the sequence $\{r_k\}$ where $r_k = \frac{f_{k+1}}{f_k}$. Write out the first 7 terms of this sequence.
   (c) Should r_n converge as $n \to \infty$? If so, find the limit. If not, explain how you know.

4. If possible, we want to find the value of $\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+...}}}}$
   (a) Consider the recursive sequence $a_0 = 0$, $a_{n+1} = \sqrt{1+a_n}$. Compute the next five terms a_1, a_2, a_3, a_4, and a_5. (You can use a calculator.)
   (b) Were any of the values of a_k in the part (a) greater than 2?
   (c) Explain how you can tell that $a_n < 2$ for all n.
   (d) How do you know that $a_{n+1} > a_n$?
   (e) Since $\{a_n\}$ is increasing and bounded above by 2, the Monotone Sequence Theorem says that $\{a_n\}$ converges. If $\lim_{n\to\infty} a_n = a$, show that $a = \sqrt{1+a}$.
   (f) What is the value of $\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+\cdots}}}}$?