LAST NAME: FIRST NAME:

MATH 009C - Summer 2018

Worksheet 4: July 17, 2018

1. Determine whether the sequence converges or diverges. If it converges, find its limit.

(a) $a_n = n \sin\left(\frac{1}{n}\right)$

(b) $a_n = \left(1 + \frac{2}{n}\right)^n$

(c) $a_n = \sin\left(\left(n - \frac{1}{2}\right)\pi\right)$

Please, show all work.

2. Consider two games, Game A and Game B, with the following rules:

In Game A, you simply lose \$1 every time you play.
In Game B, you count how much money you have left. If it is an even number, you win \$3. Otherwise you lose \$5.

Suppose you start out with \$100. Answer and explain your solutions to the following questions:

- What happens if you just play Game A exclusively?
- What happens if you play Game B exclusively?
- What happens if you play them alternatively, say B, then A, then B, etc. (So that is BABABABA...)? What can you conclude?
- **Challenge**: Can you use sequences to explain the result?

Please, show all work.

3. Use the Squeeze Theorem to show that the following sequence is convergent.

$$a_n = \frac{\cos^n(n)}{\ln(n)}$$

Please, show all work.