

Homework 45

The **due date** for this homework is **Tue 7 May 2013 12:00 AM EDT**.

Question 1

$$\lim_{n \rightarrow +\infty} n \sin \frac{2}{n} =$$

- ☐ The limit does not exist.
- ☐ $\frac{1}{2}$
- ☐ 1
- ☐ 2
- ☐ $+\infty$
- ☐ 0

Question 2

$$\lim_{n \rightarrow +\infty} [1 - (-1)^n] =$$

- ☐ 1
- ☐ The limit does not exist.
- ☐ $+\infty$
- ☐ 0
- ☐ 2
- ☐ -1

Question 3

$$\lim_{n \rightarrow +\infty} \left(\frac{n-1}{n+2} \right)^{n+2} =$$

- ☐ e^{-3}
- ☐ 0
- ☐ e^{-1}
- ☐ e^2
- ☐ e
- ☐ e^3

Question 4

$$\lim_{n \rightarrow \infty} \left(\frac{n-1}{n+1} \right)^{2n} =$$

- ☐ 1
- ☐ e^{-4}
- ☐ e^2
- ☐ 0
- ☐ e^4
- ☐ e^{-2}

Question 5

$$\lim_{n \rightarrow +\infty} \left(\frac{1}{1+n} \right)^{1+n} =$$

- ☐ The limit does not exist.
- ☐ e
- ☐ 1
- ☐ e^{-1}

- ☐ 0
- ☐ $+\infty$

Question 6

Consider the sequence defined by $a_0 = 2$ and the recursion relation

$$a_{n+1} = \frac{2}{2 + a_n}. \text{ What is the limit } L = \lim_{n \rightarrow \infty} a_n?$$

- ☐ $L = 2$
- ☐ $L = \sqrt{2} - 1$
- ☐ $L = \sqrt{3} - 1$
- ☐ $L = \frac{1}{2}$
- ☐ $L = \frac{1 + \sqrt{5}}{2}$
- ☐ $L = \sqrt{3}$

Question 7

The Pell numbers are an infinite sequence of integers defined by $P_0 = 0$, $P_1 = 1$ and the recursion relation $P_{n+1} = 2P_n + P_{n-1}$. What is the limit δ_S as $n \rightarrow +\infty$ of the ratios $\frac{P_n}{P_{n-1}}$ of subsequent Pell numbers?

Note: this limit is called the *silver ratio* by analogy with the golden ratio that appeared in the Fibonacci sequence.

- ☐ $\delta_S = 1 - \sqrt{2}$
- ☐ $\delta_S = 1$
- ☐ $\delta_S = 1 + \sqrt{2}$
- ☐ $\delta_S = \frac{\sqrt{2}}{2}$

- ☐ $\delta_S = \sqrt{2}$
- ☐ $\delta_S = \sqrt{2} - 1$

Question 8

Consider the sequence defined by $a_0 = 0, a_1 = 1$ and the recursion relation $a_{n+1} = a_n - a_{n-1}$. What is the limit $L = \lim_{n \rightarrow \infty} a_n$?

- ☐ $L = 0$
- ☐ $L = \frac{1 - \sqrt{5}}{2}$
- ☐ $L = +\infty$
- ☐ The limit does not exist.
- ☐ $L = 1$
- ☐ $L = \frac{1 + \sqrt{5}}{2}$

☐ In accordance with the Honor Code, I certify that my answers here are my own work.

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