

Solutions for Partial Review: Intro to Recursion

1. 17, 14, 11
This sequence is an arithmetic sequence.
The first term is 29. Each succeeding term is 3 less than the preceding term.

2. 29, 47, 76
This sequence is a Fibonacci sequence.
The first term is 3, and the second term is 4. Each succeeding term is the sum of the two previous terms.

5. 30, 37, 45
This sequence is not one of our 4 identified sequences.

$$\begin{cases} t_1 = 9 \\ t_i = t_{i-1} + i - 1 \end{cases}$$

6. $a_{13} = \frac{24}{7}$ and $a_{83} = \frac{4}{7}$

3. $\frac{256}{5}, \frac{1024}{25}, \frac{4096}{125}$

This sequence is a geometric sequence.

$$\begin{cases} a_1 = 125 \\ a_n = \frac{4}{5} a_{n-1} \end{cases}$$

4. 67, 131, 259
This sequence represents mixed recursion.

$$\begin{cases} a_1 = 5 \\ a_n = 2a_{n-1} - 3 \end{cases}$$

8. 8 12 18 27

9. 15 26 37 48 59

10. a) let M_t = the amount of medicine in the body (mg) after t hours

$$\begin{cases} M_0 = 40 \\ M_t = 0.8M_{t-1} + 5 \end{cases}$$

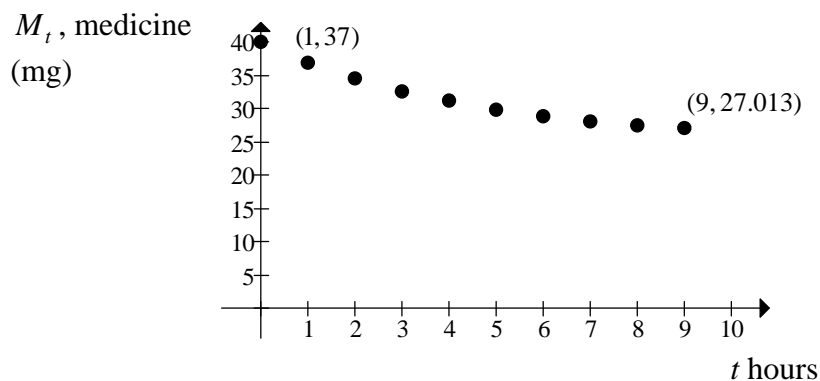
b)

| | | | | | |
|-------------|----|----|------|-------|--------|
| t (hours) | 0 | 1 | 2 | 3 | 4 |
| M_t (mg) | 40 | 37 | 34.6 | 32.68 | 31.144 |

- c) $M_7 = 28.146$

The level of medicine in the patient's body after 7 hours is 28.1 mg.

d)



The sequence of dots does not accurately represent the amount of medicine in the patient's body since the graph is a *discrete* set of points. However, the level of medicine in the patient's body is a *continuous* function of time. That is, at any given time, even some portion of an hour, the patient has some level of medicine present. Also, connecting the dots with a smooth decreasing curve would not necessarily represent the situation well since the level of medicine present in the body would probably spike a bit upon administering the new dose of medicine each hour.

e) $M_{12} = 26.031$ and $M_{13} = 25.825$

The patient has less than 26 mg of the medicine in his or her body after 13 hours.

f)

| | | | | | | |
|-------------|----|--------|--------|--------|--------|---------|
| t (hours) | 0 | 10 | 20 | 30 | 40 | 50 |
| M_t (mg) | 40 | 26.611 | 25.173 | 25.019 | 25.002 | 25.0002 |

Over time, the level of medicine in the patient's body approaches 25 mg.