

1. Enter each of the following sequences in your calculator and tabulate them to 3 decimal places for values on the range $1 \leq n \leq 10$. Based on your results, conjecture whether the sequences: a) converge to a limit L ; b) are increasing or decreasing:

$$\text{a) } a_n = \frac{n^2 - n}{2n^2 + 1}$$

n	1	2	3	4	5	6	7	8	9	10
a_n										

a) converge to a limit L _____; b) increasing; ___ decreasing; ___ neither.

$$\text{b) } a_n = \frac{n^4}{2^n}$$

n	1	2	3	4	5	6	7	8	9	10
a_n										

a) converge to a limit L = _____; b) ___ increasing; ___ decreasing; ___ neither.

$$\text{c) } a_n = (-1)^n \frac{n}{n+1}$$

n	1	2	3	4	5	6	7	8	9	10
a_n										

a) converge to a limit L = _____; b) ___ increasing; ___ decreasing; ___ neither.

$$\text{d) } a_n = \left(1 + \frac{1}{n}\right)^n$$

n	1	2	3	4	5	6	7	8	9	10
a_n										

a) converge to a limit L = _____; b) increasing; ___ decreasing; ___ neither.

2. Suppose that your car has a 14 gallon gas tank that you fill as soon as the level drops below a half tank. Every time that you fill up, you add 1 quart (1/4 gallon) of an additive that mixes completely with the gas and is used along with the gas.

a) Write a difference equation and initial value that models the amount A_n of additive in the tank at the time of the n^{th} -tank fill-up.

b) Use your calculator and the difference equation in Part a) to tabulate to 3 decimal places the amount A_n of additive in the tank at the n^{th} -fill-up for n between 1 and 10:

n	1	2	3	4	5	6	7	8	9	10
A_n										

c) Find the solution (i.e. the n^{th} -term formula for the difference equation and initial value in Part a): By applying the formula on Page 368, we obtain

d) Show that the solution that you obtained in Part c) satisfies the difference equation and has the initial value that you stated in Part a):

e) Find the limiting value for the amount A_n of additive in the tank at the n^{th} -fill-up as n increases without bound.

d) How would the difference equation and limiting value for A_n change if you fill up when the tank is 40% full instead of 50% full? Explain your answer briefly.

