

QUESTION 2. (a) Solve the following inequality.

$$\left| \frac{2}{5x^2 + 6x + 7} \right| < \frac{1}{3}$$

Answer:

(b) Solve the following inequality.

$$\frac{1}{x+1} < \frac{1}{x^2 + 4x + 3}.$$

Answer:

QUESTION 3. Suppose that a population of bacteria is monitored daily. Its volume is multiplied by the same number every day. Hence, the volume V_t on day t satisfies the DTDS

$$V_{t+1} = rV_t.$$

Suppose that the initial volume is $V_0 = 8\text{ml}$ and the volume at day 17 is $V_{17} = 16\text{ml}$.

(a) Find the value of r .

Answer:

(b) On which day is the volume equal to 64ml?

Answer:

QUESTION 4. Suppose that when you finish your studies and it is time to pay back your loans, you have a debt of \$ 100,000. From now on, at the beginning of each month, the bank adds 0.5% of the current value in interest. At the end of each month, you pay \$1,000. You receive a monthly statement of the remaining value of your loan, denoted L_t , immediately after your t -th payment and before any interest is applied. (In particular, $L_0 = 100,000$.)

(a) Write down the DTDS for L_t and the updating function.

The DTDS is: $L_{t+1} =$

The updating function is: $f(L) =$

(b) When you receive the statement for L_{16} , you realize that you have lost the statement for L_{15} . Find the formula that calculates L_{15} from L_{16} .

$L_{15} =$

(c) Write down the general solution formula for the DTDS.

Answer:

(d) How many months does it take to pay down the entire loan? Calculate the smallest t for which $L_t \leq 0$.

Answer:

(e) Your bank changes its mailing policies: To save money, they only send out a statement every other month. Your payment schedule does not change. Find the corresponding updating function.

Answer: $L_{t+2} =$