Advanced Mathematical techniques in Chemical Engineering

Module II : Onto, into, one to one function, completeness of space

Exercises

1. Consider the function $y = f(x) = e^{-x}$. The domain of x is (0,∞).

(i) If the domain of y is (0,1), check whether y is onto, into or one to one.

(ii) If the domain of y is (0,∞), check whether y is onto, into or one to one.

2. Find whether the sequence,{x_k} is a Cauchy sequence or not. $x_{k+1} = 6 - \frac{9}{x_k}$. Check its completeness.

3. Consider the function $y = f(x) = e^{-x}/(1-e^{-x})$. The domain of x is (0,∞).

(ii) If the domain of y is (0,1), check whether y is onto, into or one to one.
If the domain of y is (0,∞), check whether y is onto, into or one to one.

4. Consider the function $y = f(x) = \frac{ax^2}{1+x^4}$. The domain of x is (0,∞).

(iii) If the domain of y is (0,1), check whether y is onto, into or one to one.
If the domain of y is (0,∞), check whether y is onto, into or one to one.

5. Consider the function $y = f(x) = e^{-x}/x$. The domain of x is (0,∞).

(iv) If the domain of y is (0,1), check whether y is onto, into or one to one.
If the domain of y is (0,∞), check whether y is onto, into or one to one.

6. The function $y = \frac{5x}{5x+4}$ is valid for $-1 \le x \le 3$. Check whether y is onto, into or one-to-one, if (a) E=[$-\infty, \infty$ }; (b) E=[$-\infty, 0$]; (c) E=[$0, -\infty$]; (d) E=[0,1].