1. Nov/2022/Paper_9709_31/No.10

A gardener is filling an ornamental pool with water, using a hose that delivers 30 litres of water per minute. Initially the pool is empty. At time t minutes after filling begins the volume of water in the pool is V litres. The pool has a small leak and loses water at a rate of $0.01V$ litres per minute.

The differential equation satisfied by V and t is of the form $\frac{dV}{dt} = a - bV$.

(a) Write down the values of the constants a and b. [1]

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(b) Solve the differential equation and find the value of t when $V = 1000$. [6]

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(c) Obtain an expression for V in terms of t and hence state what happens to V as t becomes large. [2]

2. Nov/2022/Paper_9709_33/No.2

Expand $\sqrt{\dfrac{1+2x}{1-2x}}$ in ascending powers of x, up to and including the term in x^2, simplifying the coefficients. [5]