Iteration

Question 1

The number of animals in a population at the start of year t is P_t

The number of animals at the start of year 1 is 400

Given that

$$P_{t+1} = 1.01P_t$$

work out the number of animals at the start of year 3

..... animals

(2 marks)

Question 2

The equation $x^3 + x = 7$ has a solution between 1 and 2

The equation $x^3 + x = 7$ can be rearranged to give $x = \sqrt{[3]}7 - x$

Starting with $x_0 = 2$, use the iteration formula $x_{n+1} = \sqrt{[3]}7 - x_n$ three times to find an estimate for a solution of $x^3 + x = 7$

.....

(3 marks)

Question 3

Using $x_{n+1} = -2 - \frac{4}{x^2 n}$

with $x_0 = -2.5$

Explain the relationship between the values of x_1, x_2 and x_3 and the equation $x^3 + 2x^2 + 4 = 0$

.....

(2 marks)

Question 4

The equation $2x^3 + 4x = 3$ can be rearranged to give $x = \frac{3}{4} - \frac{x^3}{2}$

Starting with $x_0 = 0$, use the iteration formula $x_{n+1} = \frac{3}{4} - \frac{x_n{}^3}{2}$ three times to find an estimate for the solution to $2x^3 + 4x = 3$

$x_3 =$ .....

(3 marks)

Question 5

Show that the equation $x^3 + 7x - 5 = 0$ has a solution between $x = 0$ and $x = 1$

.....

(2 marks)

Question 6

The number of bees in a beehive at the start of year n is P_n .
The number of bees in the beehive at the start of the following year is given by

$$P_{n+1} = 1.05(P_n - 250)$$

At the start of 2015 there were 9500 bees in the beehive.

How may bees will there be in the beehive at the start of 2018?

..... bees

Question 7

Starting with $x_0 = 2$, use the iteration formula $x_{n+1} = \sqrt{[}3]{3x_n{}^2 - 3}$ to find the value of x_2.

Give your answer correct to 3 decimal places.

$x_2 =$ .....

(3 marks)

Question 8

Using $x_{n+1} = -2 - \frac{4}{x^2 n}$

with $x_0 = -2.5$

find the values of x_1, x_2 and x_3

$x_1 =$ .....

$x_2 =$ .....

$x_3 =$ .....

(3 marks)

Question 9

The equation $x^3 + 5x - 4 = 0$ can be arranged to give $x = \frac{4}{x^2+5}$

(c) Starting with $x_0 = 0$, use the iteration formula $x_{n+1} = \frac{4}{x_{n^2}+5}$ twice to find an estimate for the solution of $x^3 + 5x - 4 = 0$

$x_1 =$ .....

$x_2 =$ .....

(3 marks)

Question 10

The equation $3x^2 - x^3 + 3 = 0$ can be arranged to give $x = 3 + \frac{3}{x^2}$

Using

$x_{n+1} = 3 + \frac{3}{(x_n)^2}$ with $x_0 = 3.2$,

find the values of x_1, x_2 and x_3

Write each solution correct to 5 decimal places.

$x_1 =$ .....

$x_2 =$ .....

$x_3 =$ .....

Question 11

The equation $x^3 + 4x = 1$ can be arranged to give $x = \frac{1}{4} - \frac{x^3}{4}$

Starting with $x_0 = 0$, use the iteration formula $x_{n+1} = \frac{1}{4} - \frac{(x_n)^3}{4}$ twice, to find an estimate for the solution of $x^3 + 4x = 1$

Write all the digits on your calculator display.

$x_1 =$ .....

$x_2 =$ .....

Question 12

The number of slugs in a garden t days from now is p, where

$$p_0 = 100 p_{t+1} = 1.06 p_t$$

Work out the number of slugs in the garden 3 days from now.

..... slugs
