Victoria University
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MID Term Assessment

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Answer to the question no 1(a)

 # If 8/9 is approximated to 0.8889. Find

a) **absolute error**

Here,

True Value = $\frac{8}{9}$

Approximate Value = 0.8889

We know that,

$$E_A = |X - x|$$

$$E_A = |\frac{8}{9} - 0.8889|$$

$$E_A = |\frac{8}{9} - \frac{8889}{10000}|$$

$$E_A = |\frac{80000 - 80001}{90000}|$$

$$E_A = |\frac{-1}{90000}|$$

$$\boldsymbol{E_A = \frac{1}{90000}}$$

Answer to the question no 1(b)

b) **relative error**

Relative Error:

$$E_R = \frac{E_A}{X}$$

$$E_R = \frac{\frac{1}{90000}}{\frac{8}{9}}$$

$$E_R = \frac{1 \text{ x } 9}{90000 \text{ x } 8}$$

$$E_R = \frac{1}{80000}$$

$E_R = 0.0000125$

Answer to the question no 1(c)

c) percentage error

$E_P = E_R \text{ x } 100$

$E_P = 0.0000125 \text{ x } 100$

$\boldsymbol{E_P = 0.00125}$

Answer to the question no 3

 # Find the root of the equation x ^{4} − x − 10 = 0, using bisection method.

Answer:

The equation is,

$f(x) = x^4 - x - 10$

$f(0) = 0^4 - 0 - 10 = -10\ (-ve)$

$f(1) = 1^4 - 1 - 10 = -10\ (-ve)$

$f(2) = 2^4 - 2 - 10 = 4\ (+ve)$

Since, $f(1)$ is (-ve) and $f(2)$ is (+ve), the root lies between 1 and 2.

First approximation-

$x1 = \frac{1+2}{2} = \frac{3}{2} = 1.5$

$f(x1) = (1.5)^4 - (1.5) - 10$

$f(x1) = -6.4375$

$x2 = \frac{1.5+2}{2} = \frac{3.5}{2} = 1.75$

$f(x2) = (1.75)^4 - (1.75) - 10$

$f(x2) = -2.37109$

$x3 = \frac{1.5 + 1.75}{2} = \frac{3.25}{2} = 1.625$

$f(x3) = (1.625)^4 - (1.625) - 10$

$f(x3) = -4.6521$

$x4 = \frac{1.75 + 1.625}{2} = \frac{3.375}{2} = 1.6875$

$f(x4) = (1.6875)^4 - (1.6875) - 10$

$f(x4) = -3.57835$

$x5 = \frac{1.625 + 1.6875}{2} = 1.65625$

$f(x5) = (1.65625)^4 - (1.65625) - 10$

$f(x5) = -4.1313$

$x6 = \frac{1.6875 + 1.65625}{2} = 1.671875$

$f(x6) = (1.671875)^4 - (1.671875) - 10$

$f(x6) = -3.8589$

$x7 = \frac{1.65625 + 1.671875}{2} = 1.6641$

$f(x7) = -3.9961$

$x8 = \frac{1.671875 + 1.6641}{2} = 1.66799$

$f(x8) = -3.9274$

$x9 = \frac{1.6641 + 1.66799}{2} = 1.666$

$f(x9) = -3.9615$

$$x10 = \frac{1.66799 + 1.666}{2} = 1.667$$
$$f(x10) = -3.9449$$

$$x11 = \frac{1.666 + 1.667}{2} = 1.6665$$
$$f(x11) = -3.9535$$

$$x12 = \frac{1.667 + 1.6665}{2} = 1.66675$$
$$f(x12) = -3.94916$$

$$x13 = \frac{1.6665 + 1.66675}{2} = 1.66663$$
$$f(x13) = -3.95135$$

$$x13 = \frac{1.66675 + 1.66663}{2} = 1.66669$$
$$f(x13) = -3.95021$$

$$x14 = \frac{1.66663 + 1.66669}{2} = 1.666696$$
$$f(x14) = -3.95073$$

$$x15 = \frac{1.66669 + 1.666696}{2} = 1.66669$$
$$f(x15) = -3.95016$$

Hence, the root of this equation is 1.66669

Answer to the question no 4

 # Compute the root of the equation,x3 − 4x − 9 = O, by Regula-Falsi method, correct to two decimal places.

Answer: Here,

$f(2) = -9$

$f(3) = 6$

Therefore, root lies between 2 and 3

$a = 2;\ f(a) = -9$

$b = 3;\ f(b) = 6$

Substituting the values in the formula,

$$x = \frac{bf(a) - af(b)}{f(a) - f(b)}$$

We get,

$$x1 = \frac{3(-9) - 2(6)}{-9 - 6} = 2.6$$

$f(x1) = -1.824$

Therefore, x1 becomes a to find the next point.

$$x2 = \frac{3(-1.824) - 2.6(6)}{-1.824 - 6} = 2.693251534$$

$f(x2) = -0.23722651$

Therefore, x2 becomes a to find the next point.

$$x3 = \frac{3(-0.23722651) - 2.693251534(6)}{-0.23722651 - 6} = 2.704918397$$

$f(x3) = -0.028912179$

Therefore, x3 becomes a to find the next point.

$$x4 = \frac{3(-0.028912179) - 2.704918397(6)}{-0.028912179 - 6} = 2.70633487$$

$$f(x4) = -3.495420729 \text{ x } 10^{-3}$$

Therefore, x4 becomes a to find the next point.

$$x5 = \frac{3(-3.495420729 \text{ x } 10^{-3}) - 2.70633487(6)}{(-3.495420729 \text{ x } 10^{-3}) - 6} = 2.706505851$$

$$f(x5) = -3.973272762 \text{ x } 10^{-4}$$

Therefore, x5 becomes a to find the next point.

$$x6 = \frac{3(-3.973272762 \text{ x } 10^{-4}) - 2.706505851(6)}{(-3.973272762 \text{ x } 10^{-4}) - 6} = 2.706525285$$

Therefore, the positive root corrected to two decimal places is 2.71

Answer to the question no 5

Answer:

$$f(x) = x^3 - 4x - 9$$

$$f(1) = 1 - 4 - 9 = -12$$

$$f(2) = 8 - 8 - 9 = -9$$

$$f(3) = 27 - 12 - 9 = 6$$

So, root lies between 2 & 3

$$x^3 - 4x - 9 = 0$$

$$x^3 = 4x + 9$$

$$x = \sqrt[3]{4x + 9}$$

Take initial value $x_0 = 2.6$

$x_1 = f(x_0) = \sqrt[3]{4(2.6) + 9} = 2.687$

$x_2 = f(x_1) = \sqrt[3]{4(2.69) + 9} = 2.704$

$x_3 = f(x_2) = \sqrt[3]{4(2.70) + 9} = 2.705$

Here, the x_2 & x_3 are same up to 02 (two) decimal point.

So, root is 2.70

Answer to the question no 6 (i)

 # Convert the binary number 01 1 1.0111 to decimal system

Answer:

Binary Number to Decimal System:

0111.0111_2 in Binary number system and want to translate it into Decimal.

To do this, at first translate it to decimal here so:

0111.0111_2

$= (0 \text{ x } 2^3) + (1 \text{ x } 2^2) + (1 \text{ x } 2^1) + (1 \text{ x } 2^0) + (1 \text{ x } 2^{-1}) + (1 \text{ x } 2^{-2}) + (1 \text{ x } 2^{-3}) + (1 \text{ x } 2^4)$

$= 0 + 4 + 2 + 1 + 0 + 0.25 + 0.125 + 0.0625$

$= 7.4375$

So, The Converting Result:

$\mathbf{0111.0111_2 = 7.4375_{10}}$

Answer to the question no 6 (ii)

Convert the hexadecimal number F2C.A to decimal system

Answer:

Hexadecimal Number to Decimal System:

F2C.A in Hexadecimal number system and want to translate it into Decimal.

To do this, at first translate it to decimal here so:

$\mathrm{F2C.A}_{16}$

$= (15 \text{ x } 16^2) + (2 \text{ x } 16^1) + (12 \text{ x } 16^0) + (10 \text{ x } 16^{-1})$

$= 3840 + 32 + 12 + 0.625$

$= 3884.625$

So, The Converting Result:

$\mathbf{F2C.A_{16} = 3884.625_{10}}$

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