EULER METHOD

Q1-solve the boundary value problem, $\frac{dy}{dx} = \frac{y-x}{y+x}$, y(0)=1

find y(0.1)

Out[86]= 0.1 find y

In[106]:=
```
f[x_, y_] = (y - x)/(x + y);
y[1] = 1;
x[1] = 0;
h = 0.02;
For[i = 1, i ≤ 6, i++, x[i + 1] = x[i] + h;
 y[i + 1] = y[i] + h * f[x[i], y[i]];
 Print[{x[i], y[i]}]]
```

```
{0, 1}
{0.02, 1.02}
{0.04, 1.03923}
{0.06, 1.05775}
{0.08, 1.0756}
{0.1, 1.09283}
```

Q2-solve the boundary value problem, $\frac{dy}{dx} = x^2 + y^2$, y(0)=1. find y(0.02).

In[111]:=
```
f[x_, y_] = x^2 + y^2;
y[1] = 1;
x[1] = 0;
h = 0.002;
For[i = 1, i ≤ 41, i++, x[i + 1] = x[i] + h;
 y[i + 1] = y[i] + h * f[x[i], y[i]];
 Print[{x[i], y[i]}]]
```

```
{0, 1}
{0.002, 1.002}
{0.004, 1.00401}
{0.006, 1.00602}
```

{0.008, 1.00805}

{0.01, 1.01008}

{0.012, 1.01212}

{0.014, 1.01417}

{0.016, 1.01623}

{0.018, 1.01829}

{0.02, 1.02037}

{0.022, 1.02245}

{0.024, 1.02454}

{0.026, 1.02664}

{0.028, 1.02875}

{0.03, 1.03087}

{0.032, 1.033}

{0.034, 1.03513}

{0.036, 1.03728}

{0.038, 1.03943}

{0.04, 1.0416}

{0.042, 1.04377}

{0.044, 1.04595}

{0.046, 1.04815}

{0.048, 1.05035}

{0.05, 1.05256}

{0.052, 1.05478}

{0.054, 1.05701}

{0.056, 1.05925}

{0.058, 1.0615}

{0.06, 1.06376}

{0.062, 1.06603}

{0.064, 1.06831}

{0.066, 1.0706}

{0.068, 1.0729}

{0.07, 1.07521}

{0.072, 1.07754}

{0.074, 1.07987}

{0.076, 1.08221}

{0.078, 1.08457}

{0.08, 1.08693}

In[116]:=

Q3-solve the boundary value problem, $\frac{dy}{dx} = \text{Log}[x + y], y[0] = 0$find y[0.02]

In[117]:=

In[118]:=
```
f[x_, y_] = Log[x + y];
y[1] = 1;
x[1] = 0;
h = 0.02;
For[i = 1, i ≤ 11, i++, x[i + 1] = x[i] + h;
 y[i + 1] = y[i] + h * f[x[i], y[i]];
 Print[{x[i], y[i]}]]
```

{0, 1}

{0.02, 1.}

{0.04, 1.0004}

{0.06, 1.00119}

{0.08, 1.00238}

{0.1, 1.00396}

{0.12, 1.00594}

{0.14, 1.00831}

{0.16, 1.01108}

{0.18, 1.01423}

{0.2, 1.01778}

In[123]:=
```
k[x1_, y1_] = ∫_0^0.02 Log[x + y] dx
k[0.02, y1]
```

Out[123]=

$-0.02 - 1.\ y\ \text{Log}[y] + (0.02 + y)\ \text{Log}[0.02 + y]$

Out[124]=

$-0.02 - 1.\ y\ \text{Log}[y] + (0.02 + y)\ \text{Log}[0.02 + y]$