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In [1]:
```
import matplotlib.pyplot as plt
import odeSolver as os
import numpy as np
```

Problem 2

BVP:

$$y'' - 2y' + y = xe^x - x$$

Where $x \in [0, 2], y(0) = 0, y(2) = -4, h = 0.2$

The exact solution is

$$y(x) = \frac{1}{6}x^3e^x - \frac{5}{3}xe^x + 2xe^x - x - 2$$

In [2]:
```
p = -2
q = 1
fprime = lambda x : x*np.exp(x)-x
f = lambda x : 1/6*x**3*np.exp(x) - 5/3*x*np.exp(x) + 2*np.exp(x) - x - 2
```

In [3]:
```
ta = 0
ya = 0

tb = 2
yb = -4
h = 0.2

y,x = os.solveODE2(fprime,p,q,ta,ya,tb,yb,h=h)
```

In [5]:
```
plt.figure(figsize=(10,10))

plt.plot(x,f(x),label='exact Solution')
plt.plot(x,y,'--*',label= 'FDM Solution')

plt.xlabel('x')
plt.ylabel('y(x)')
plt.grid()
plt.legend()
```

Out[5]: <matplotlib.legend.Legend at 0x7fdf4b1c6da0>