

# CSU33081: Computational Mathematics

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## Assignment 2 - Senán d'Art - 17329580

### Question 1

Answer: (ii)

$$L = \begin{bmatrix} 1.0000 & 0 & 0 & 0 \\ -2.0000 & 1.0000 & 0 & 0 \\ 0.5000 & 1.5000 & 1.0000 & 0 \\ -2.0000 & 3.0000 & -0.5000 & 1.0000 \end{bmatrix}$$

$$U = \begin{bmatrix} 4.0000 & -1.0000 & 3.0000 & 2.0000 \\ 0 & -2.0000 & 3.0000 & 0.5000 \\ 0 & 0 & 4.0000 & 2.0000 \\ 0 & 0 & 0 & 3.0000 \end{bmatrix}$$

```
[L, U] = LUdecompGauss([4 -1 3 2;-8 0 -3 -3.5;2 -3.5 10 3.75;-8
```

```
function [L, U] = LUdecompGauss (A)
    [x, y] = size(A)
    if x <= 0 || x ~= y
        disp("Matrix Is Not Square!");
        return
    end

    L = eye(x, x);
    U = A;

    for i = 1:x
        for j = i + 1:x
            c = U(j, i) / U(i, i);
            for k = 1:x
                U(j, k) = U(j, k) - (c * U(i, k));
            end
            L(j, i) = c;
        end
    end
end
```

### Question 2

Best: 2 & 5

Worst: 1

### Question 3

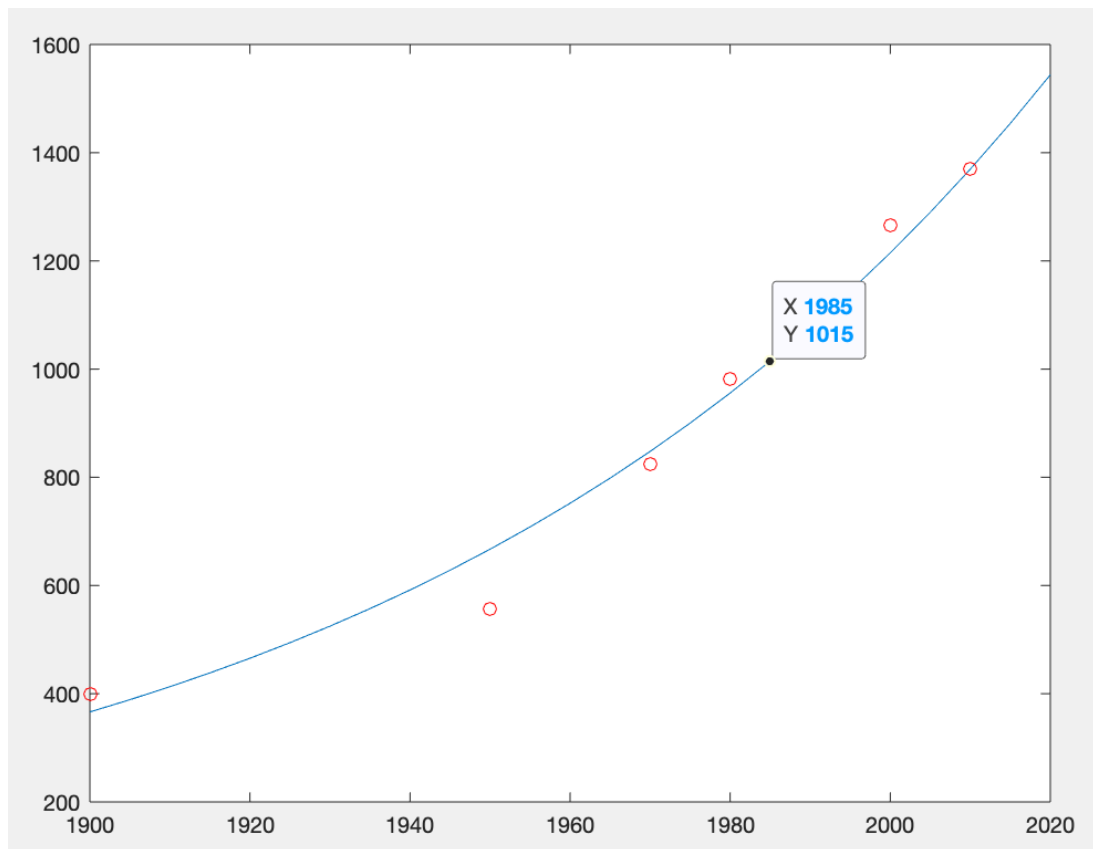
Eqn:  $p = be^{mx}$

Linear (from slides):  $\ln(p) = mx + \ln(b)$

The following code was used:

```
[a1, a0] = LinearReg(time, log(population));
years = 1900:5:2020;
plot(years, exp(a0) * exp(a1 * years), time, population, 'ro')

function [a1, a0] = LinearReg(x,y)
    nx=length(x);
    ny=length(y);
    if nx ~= ny
        disp('ERROR: The number of elements in x must be the sa
        a1 = 'Error';
        a0 = 'Error';
    else
        Sx = sum(x);
        Sy = sum(y);
        Sxy = sum(x.*y);
        Sxx = sum(x.^2);
        a1 = (nx*Sxy-Sx*Sy)/(nx*Sxx-Sx^2);
        a0 = (Sxx*Sy-Sxy*Sx)/(nx*Sxx-Sx^2);
    end
end
```



Answer: (i)

$$b = 4.6831 * 10^{-8}$$

$$m = 0.022$$

$$Pop = 1014$$