Homework 2

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Problem 1

In[ ]:= `ClearAll["Global`*"];`

`MatrixForm[Array[If[#1 + #2 − 1 > n, 0, #1 + #2 − 1] &, {n, n}]] /. n → 8`

⋯ Array: Single or list of non−negative machine−sized integers expected at position 2 of Array[If[#1 + #2 − 1 > n, 0, #1 + #2 − 1] &, {n, n}].

Out[ ]//MatrixForm=

$$\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 2 & 3 & 4 & 5 & 6 & 7 & 8 & 0 \\ 3 & 4 & 5 & 6 & 7 & 8 & 0 & 0 \\ 4 & 5 & 6 & 7 & 8 & 0 & 0 & 0 \\ 5 & 6 & 7 & 8 & 0 & 0 & 0 & 0 \\ 6 & 7 & 8 & 0 & 0 & 0 & 0 & 0 \\ 7 & 8 & 0 & 0 & 0 & 0 & 0 & 0 \\ 8 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

Problem 2

In[ ]:=

```
ClearAll["Global`*"];
Plot[BesselJ[1, x], {x, 0, 25}];
a = 3; b = 25; n = 41;
dx = (b − a)/(n − 1);

s = 0;
Do[a = BesselJ[1, x] * BesselJ[1, x + dx];
  If[Sign[a] == −1, s = s + 1;
    v[s] = x], {x, a, b}];
Array[v, 4] (*Note that the one at 3.7 wasn't
   obtained as we are using a quite large n=41 . I tried with a=0;
 b=20; n=21; and it worked*)
```

Out[ ]= {7, 10, 13, 16}

Problem 3

```
In[●]:= ClearAll["Global`*"]
      t0 = 0.00001;  α = π/4;  a₀ = 1;  b₀ = Cos[α];  c₀ = Cos[α];
```

```
      For[n = 1, n < 9, ++n, aₙ = 1/2 (aₙ₋₁ + bₙ₋₁);

       bₙ = √(aₙ₋₁ * bₙ₋₁) ;

       cₙ = 1/2 (aₙ₋₁ - bₙ₋₁)] (*I used n=9 from trial and error. As illustrated below,
      I already got some value of cₙ and It is obvious that c₄ satisfies the conition *)
      N[c₁]
      N[c₂]
      N[c₃]
      N[c₄]
      For[i = 1, Abs[cᵢ] < t0, i++, Print[i]]
      (*I have no idea why this loop doesn't work. However,
      I was able to know N from direct values as it is only for*)

      k = π/(2 N[a₄])

      N[EllipticK[Sin[π / 4]^2]]
      k == N[EllipticK[Sin[π / 4]^2]] (*True like expected*)
```

```
Out[●]= 0.146447
```

```
Out[●]= 0.00632849
```

```
Out[●]= 0.0000118181
```

```
Out[●]= 4.12138 × 10⁻¹¹
```

```
Out[●]= 1.85407
```

```
Out[●]= 1.85407
```

```
Out[●]= True
```

Problem 4

```
In[ ]:= ClearAll["Global`*"];
     l1 = {2, 4, 4, 5, 7, 9, 7};
     l2 = {12, 24, 4, 5, 17, 9, 7};
     l3 = Flatten[Append[l1, l2]];

     For[i := 1, i < (Length[l3] - 1), ++i,
       For[m := i + 1, m <= Length[l3], m++, If[l3[[m]] == l3[[i]], l3 = Drop[l3, {m}]]]];
     Sort[
      l3]
Out[ ]= {2, 4, 5, 7, 9, 12, 17, 24}
```

Problem 5

```
In[ ]:= ClearAll["Global`*"];
     l1 = {2, 4, 4, 5, 7, 9, 7};
     l2 = {12, 24, 4, 5, 17, 9, 7};
     d = 1;
     For[i := 1, i <= (Length[l1]), ++i,
       For[m := 1, m <= Length[l2], ++m, If[l1[[i]] == l2[[m]], l4[d] = l1[[i]];
         d = d + 1]]];
     b = Array[l4, d - 1]; (*now we have to remove the dublicate from this array *)
     DeleteDuplicates[b]

Out[ ]= {4, 5, 7, 9}
```