```
In[40]:= (* Define the prime counting function π(x) *)
        primePiFunction[x_] := PrimePi[x]



        (* Precompute π(x/e), π(x/e^2), and π(x/e^3) to optimize the function kFunction *)
        precomputePrimePi[x_] := Module[{e = E},
          {primePiFunction[x], primePiFunction[x/e],
            primePiFunction[x/(e^2)], primePiFunction[x/(e^3)]}
        ]



        (* Define the function \mathcal{K}(x) using precomputed π values *)
        kFunction[x_] := Module[{e = E, logX = Log[x], πValues},
          πValues = precomputePrimePi[x];
          πValues[[1]]^4 - (4 e x / logX) πValues[[2]]^3 +
            (6 e^2 x / logX^2) πValues[[3]]^2 - (4 e^3 x / logX^3) πValues[[4]]
        ]



        (* Evaluate the function for x = 10^k, where 4 ≤ k ≤ 7 *)
        resultsK1 = Table[{10^k, N[kFunction[10^k]]}, {k, 4, 7}]

Out[43]=
        {{10 000, 6.7855×10^11}, {100 000, 2.85871×10^15},
          {1 000 000, 1.36574×10^19}, {10 000 000, 7.37684×10^22}}

In[45]:= (* Evaluate the function for x = 10^k, where 8 ≤ k ≤ 11 *)
        resultsK2 = Table[{10^k, N[kFunction[10^k]]}, {k, 8, 11}]

Out[45]=
        {{100 000 000, 4.2993×10^26}, {1 000 000 000, 2.6665×10^30},
          {10 000 000 000, 1.73943×10^34}, {100 000 000 000, 1.18212×10^38}}

In[47]:= (* Evaluate the function for x = 10^k, where 12 ≤ k ≤ 14 *)
        resultsK3 = Table[{10^k, N[kFunction[10^k]]}, {k, 12, 14}]

Out[47]=
        {{1 000 000 000 000, 8.31051×10^41},
          {10 000 000 000 000, 6.01092×10^45}, {100 000 000 000 000, 4.45417×10^49}}
```

In[48]:= (* Evaluate the function for x = 10^k, where 15 ≤ k ≤ 16 *)
resultsK4 = Table[{10 ^ k, N[kFunction[10 ^ k]]}, {k, 15, 16}]

Out[48]=
{{1 000 000 000 000 000, 3.37014×10^{53}}, {10 000 000 000 000 000, 2.59663×10^{57}}}

In[49]:= (* Evaluate the function for x = 10^k, where k = 17 *)
resultK17 = {10 ^ 17, N[kFunction[10 ^ 17]]}

Out[50]=
{100 000 000 000 000 000, 2.03278×10^{61}}

In[51]:=