```
> restart;
> f := fopen("F:/maple/sequence.txt", READ)
```

$$f := 0 \tag{1}$$

```
> S := readdata(f, string)
```

$$[\text{输出长度超过限制 } 1000000] \tag{2}$$

```
> fclose(f);
> StringTools[Length](S[1])
```

$$1966000 \tag{3}$$

```
> Mini :=proc(f, g)
  local d;
  if max(abs(f[1]+g[1]), abs(f[2]+g[2])) ≤ min(max(abs(f[1]-g[1]), abs(f[2]
     -g[2])), max(abs(f[1]+3·g[1]), abs(f[2]+3·g[2]))) then return 1;fi;
  if max(abs(f[1]-g[1]), abs(f[2]-g[2])) ≤ min(max(abs(f[1]+g[1]), abs(f[2]
     +g[2])), max(abs(f[1]-3·g[1]), abs(f[2]-3·g[2]))) then return 1;fi;
  if g[1]≥0 then
    if g[2]≥0 then
      d := iquo(-f[1]-f[2], g[1]+g[2]);
    else
      d := iquo(-f[1]+f[2], g[1]-g[2]);
    fi;
  else
    if g[2]≥0 then
      d := iquo(f[1]-f[2], -g[1]+g[2]);
    else
      d := iquo(-f[1]-f[2], g[1]+g[2]);
    fi;
  fi;
  if modp(d, 2)=0 then d := d-1;fi;
  if max(abs(f[1]+d·g[1]), abs(f[2]+d·g[2])) ≤ max(abs(f[1]+(d+2)·g[1]),
    abs(f[2]+(d+2)·g[2])) then return d;else return d+2;fi;
  end proc:
> Rational_Approximation :=proc(S :: string, m :: integer := 1, n :: integer := -1,
    fileaddress :: string)
  local i, N, f, g, alpha, a, d, s, temp, fd, st, F, G, T, maxd;
  #option trace;
  N := n;
  st := time[real]( );
  if N < 0 or N > length(S) then N := length(S);fi;
  s := S[m];
  maxd := -1;
  i := m;
  if m = 1 then
    while s = "0" do
      i := i+1;
      s := S[i];
    od;
```

```
  alpha := 2^(i-1);
  f := [0, 2];
  g := [2^(i-1), 1];
  F := (alpha·f[2] − f[1]) / 2^i;
  G := (alpha·g[2] − g[1]) / 2^i;
else
  error "expecting m = 1."
fi;
  i := i + 1;
while i ≤ N do
  if modp(i, 100000) = 0 then print([i, time[real]( ) − st]);fi;
  if S[i] = "1" then
    F := F + f[2];
    G := G + g[2];
  fi;
  if modp(G, 2) = 0 then
    f := 2·f;
    G := G / 2;
  elif max(abs(g[1]), abs(g[2])) < max(abs(f[1]), abs(f[2])) then
    d := Mini(f, g);
    temp := f + d·g;
    T := F + d·G;
    f := 2·g;
    F := G;
    g := temp;
    G := T / 2;
if abs(d) > maxd then maxd := abs(d);fi;
  else
    d := Mini(g, f);
    g := g + d·f;
    G := (G + d·F) / 2;
    f := 2·f;
if abs(d) > maxd then maxd := abs(d);fi;
  fi;
  i := i + 1;
od;
fd := fopen(fileaddress, WRITE, BINARY);
writedata(fd, f, integer);
writedata(fd, g, integer);
writedata(fd, [F, G], integer);
writedata(fd, [i], integer);
fclose(fd);
```

```
    print([i, time[real]() - st]);
    return maxd;
    end proc:
> Rational_Approximation(S[1], 1, 1 + 2000000, "F:/maple/a");
                              [100000, 10.138]
                              [200000, 36.539]
                              [300000, 77.888]
                             [400000, 133.055]
                             [500000, 204.379]
                             [600000, 289.533]
                             [700000, 392.517]
                             [800000, 511.658]
                             [900000, 645.316]
                            [1000000, 793.230]
                            [1100000, 957.358]
                           [1200000, 1137.141]
                           [1300000, 1331.398]
                           [1400000, 1403.183]
                           [1500000, 1462.841]
                           [1600000, 1526.101]
                           [1700000, 1593.191]
                           [1800000, 1665.073]
                           [1900000, 1741.467]
                           [1966001, 1793.982]
                                 1209647                                  (4)
>
```