Link to Mathematica .nb file

Definitions

Compute s2() for large occultors using the expression in the paper (unstable) and Taylor expanding the difference of the elliptic integrals (stable)

In[1426]:=
```
s2[b_, r_, stable_] := Module[{k2, ξ, EK, EE, EP, CoeffK,
   CoeffE, BadTerm, GoodTerm, Λ, taylor, x, eps, del, EminusK},
  k2 = ((1 - (b - r)) (1 + (b - r)))/(4 b r);
  ξ = 2 b r (4 - 7 r^2 - b^2);

  EK = EllipticK[k2];
  EE = EllipticE[k2];
  EP = EllipticPi[1 - 1/(b - r)^2, k2];
  CoeffK = 8 - 2 b^2 - 3/(b r) + 12 r/b - 10 b r - 14 r^2 - 6 r^3/b;
  CoeffE = -16 + 4 b^2 + 28 r^2 ;
  x = r/b;
  eps = x - 1;
  del = r - b;
  EminusK = -π (0.25` k2 + 0.09375` k2^2 + 0.05859375` k2^3 +
      0.042724609375` k2^4 + 0.0336456298828125` k2^5 + 0.027757644653320312` k2^6 +
      0.023627042770385742` k2^7 + 0.020568184554576874` k2^8 +
      0.018211413407698274` k2^9 + 0.016339684807462618` k2^10 +
      0.01481712326858542` k2^11 + 0.013554300262740071` k2^12);

  taylor = 2 b^3 Sqrt[x] (EminusK (16 + 28 eps + 14 eps^2) - eps^2 (2 + 3 eps) EK);
  If[stable,
   BadTerm = taylor + Sqrt[b r] (8 EK - 16 EE - 3/(b r) EK + 12 (r/b) EK),
   BadTerm = Sqrt[b r] (CoeffK * EK + CoeffE * EE)
  ];
  GoodTerm = (3 ((b+r)/(b-r)) EP)/Sqrt[b r];
  Λ = (BadTerm + GoodTerm)/(9 π);
  2 π/3 (1 - 3/2 Λ - HeavisideTheta[r - b])];
```

In[1427]:=
```
With[{r = 3 × 10^4}, Plot[
  {s2[b, r, False], s2[b, r, True]}
  , {b, r - 1, r + 1}]]
```

Power: Infinite expression $\frac{1}{0.^2}$ encountered.

Power: Infinite expression $\frac{1}{0.^2}$ encountered.

Out[1427]=