

Plotting Rational Functions

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In[1]=

```
PlotRational[fct_, var_, yrange_, xrange_: {-1, 1}] :=  
Module[{f, solN, solD, sol, m, M, solT, l1, l2, x}, f = Function[var, fct]; solN =  
  Select[NSolve[Numerator[Together[f[x]]] == 0, x][[All, 1, 2]], (Chop[Im[#]] == 0 &)];  
  solD = Select[NSolve[Denominator[Together[f[x]]] == 0, x][[All, 1, 2]],  
    (Chop[Im[#]] == 0 &)]; sol = Union[solN, solD];  
  Print["The function has ", Length[solN], If[Length[solN] == 1, " zero", " zeroes"],  
    " and ", Length[solD], If[Length[solD] == 1, " pole.", " poles."];  
  m = Min[Min[sol] - 1, xrange[[1]]]; M = Max[Max[sol] + 1, xrange[[2]]];  
  solT = Append[Prepend[sol, m], M]; l1 = Map[Function[t, {t, 0}], solT]; l2 =  
    Table[{AbsoluteThickness[5], If[f[(l1[[i, 1]] + l1[[i + 1, 1]]) / 2] > 0, Red, Blue],  
      Line[{l1[[i]], l1[[i + 1]]}], {i, 1, Length[l1] - 1};  
  Plot[f[x], {x, m, M}, Prolog -> l2, BaseStyle -> {14, Bold},  
    PlotRange -> {yrange[[1]], yrange[[2]]}, PerformanceGoal -> "Quality",  
    PlotStyle -> {Black, Thick}, Exclusions -> {Denominator[Together[f[x]]] == 0},  
    ExclusionsStyle -> {{Gray, Dashed}}, ImageSize -> 640, AxesLabel -> {var, None}]
```

In[2]=

```
g[x_] = Product[x^RandomInteger[{1, 2}] - RandomReal[{-3, 3}], {2}] /  
  Product[x^RandomInteger[{1, 2}] - RandomReal[{-3, 3}], {2}]
```

Out[2]=

$$\frac{(x^2 - 1.14798)(x^2 - 0.518869)}{(x + 0.108408)(x^2 - 1.88659)}$$

In[3]:=

```
PlotRational[g[x], x, {-5, 5}]
```

The function has 4 zeroes and 3 poles.

Out[3]=

