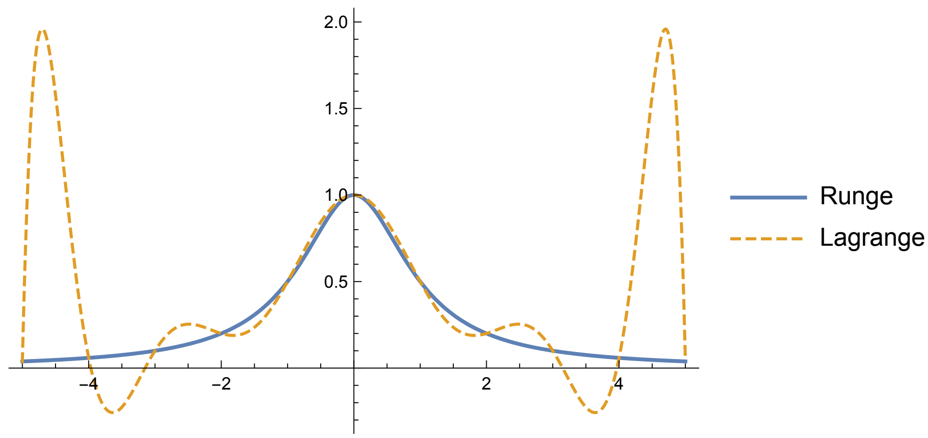
In[485]:=

```
(** a **)
Remove["Global`*"]

R[x_] := 1/(x^2 + 1)

y = Table[-5 + k, {k, 0, 10}];

r = Table[R[y[[k]]], {k, 1, 11}];

L[x_] := Table[Product[If[i ≠ k, (x - y[[i]])/(y[[k]] - y[[i]]), 1], {i, 1, 11}], {k, 1, 11}]

P[x_] := Sum[R[y[[k]]] L[x][[k]], {k, 1, 11}]

Plot[{R[x], P[x]}, {x, -5, 5},
 PlotStyle → {Thick, Dashed}, PlotLegends → {"Runge", "Lagrange"}]
```

Out[491]=

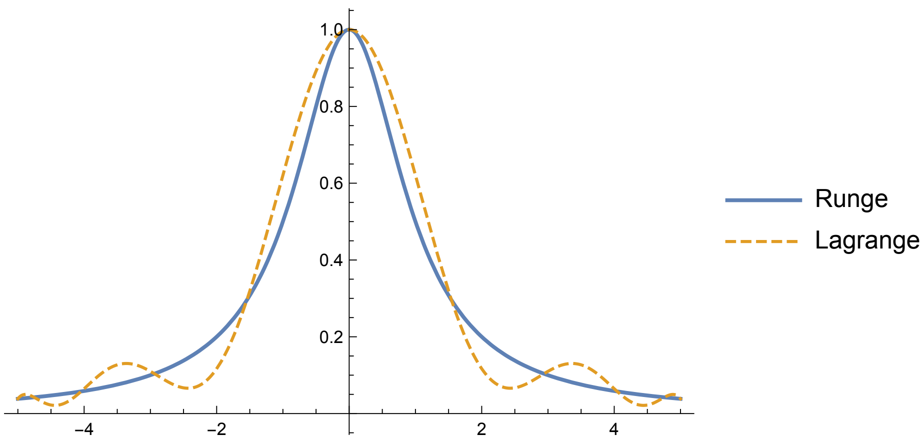


In[462]:=

```
(** What we observe from the above plot is that the Lagrange interpolating
 polynomial does a good job of representing the function on [-2,2]
 but a poor job of representing the function outside that region. **)
```

In[492]:=
```
(** c **)
Remove["Global`*"]

R[x_] := 1/(x^2 + 1)

y = Table[5 Cos[k Pi/10], {k, 0, 10}] // N;

r = Table[R[y[[k]]], {k, 1, 11}];

L[x_] := Table[Product[If[i ≠ k, (x - y[[i]])/(y[[k]] - y[[i]]), 1], {i, 1, 11}], {k, 1, 11}]

P[x_] := Sum[R[y[[k]]] L[x][[k]], {k, 1, 11}]

Plot[{R[x], P[x]}, {x, -5, 5},
 PlotStyle → {Thick, Dashed}, PlotLegends → {"Runge", "Lagrange"}]
```

Out[498]=



In[477]:=
```
(** This time, the Lagrange polynomial does a better job of
 approximating the Runge function over the entire interval. **)
```