Subject: Specifying Log Axis Tick Marks
Posted by JD Smith on Sat, 29 Oct 2005 01:19:37 GMT
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The topic of how to specify tick values for plots with log axes has come up on the list multiple times over the past several years, with no satisfying conclusion. Suppose you are motivated to create a logarithmic plot spanning less than one decade:

```
IDL>  plot,.5+randomu(sd,100)*.3,.4+randomu(sd,100)*.3,/XLOG,/YLOG ,PSYM=4
```

That results in a very unsatisfying grouping of points up in the top right of the plot. You can of course choke down the axis ranges, like so:

```
    plot,.5+randomu(sd,100)*.3,.4+randomu(sd,100)*.3,/XLOG,/YLOG , $
      PSYM=4,XRANGE=[.5,.8],YRANGE=[.4,.7],/XSTYLE,/YSTYLE
```

but you're left with two completely unlabeled axes. Aha, you say, I'll just increase the number of tick marks:

```
    plot,.5+randomu(sd,100)*.3,.4+randomu(sd,100)*.3,/XLOG,/YLOG , $
       PSYM=4,XRANGE=[.5,.8],YRANGE=[.4,.7],/XSTYLE,/YSTYLE,XTICKS= 5,YTICKS=5
```

Hmm, that's not exactly what you might like: fairly random values have been chosen for the axes. What about labeling them yourself? That should do the trick:

```
   plot,.5+randomu(sd,100)*.3,.4+randomu(sd,100)*.3,/XLOG,/YLOG ,$
      PSYM=4,XRANGE=[.5,.8],YRANGE=[.4,.7],/XSTYLE,/YSTYLE, $
      XTICKS=3,XTICKV=[.5,.7,.8],YTICKS=4,YTICKV=[.4,.5,.6,.7]
% PLOT: Data coordinate system not established.
% Execution halted at: $MAIN$
```

Ouch! So what's happening? It appears that for logarithmic plots, the data coordinate system isn't yet set, probably because the ticks are evaluated before the log coordinate frame is setup. Hence, you cannot specify the locations of the tick marks. What to do? Draw your own axes by hand using plots and xyouts? Perish the thought. It turns out you can simply skip the axes when first plotting, and use AXIS to add them straightforwardly after the coordinate frame has been set:

```
  plot,.5+randomu(sd,100)*.3,.4+randomu(sd,100)*.3,/XLOG,/YLOG ,$
       PSYM=4,XRANGE=[.5,.8],YRANGE=[.4,.7],XSTYLE=5,YSTYLE=5

 xtitle='My X Title' & ytitle='My Y Title'
```

```
  for i=0,1 do begin
    axis,XAXIS=i,/XLOG,/XSTYLE,XRANGE=10.^!X.CRANGE, $
        XTICKFORMAT=i?'(A1)':'',XTICKS=3, $
        XTICKV=[.5,.7,.8],XMINOR=10,XTITLE=i?'':xtitle
    axis,YAXIS=i,/YLOG,/YSTYLE,YRANGE=10.^!Y.CRANGE, $
        YTICKFORMAT=i?'(A1)':'',YTICKS=4, $ $
        YTICKV=[.4,.5,.6,.7],YMINOR=10.,YTITLE=i?'':ytitle
  endfor
```

And there you have it, specified logarithmic major axes ticks, with some minor axis tick marks thrown in for good measure. Should we have to do this? Probably not. But at least there is an option that doesn't require computing your own axis marks from scratch.

JD

P.S. Why would you want to plot LOG-LOG when your data span such a small range? One good reason is when you'd like to indicate a fixed ratio by drawing a single representative line. On LOG-LOG plots, a fixed length interval implies a fixed ratio; not so in linear space.
