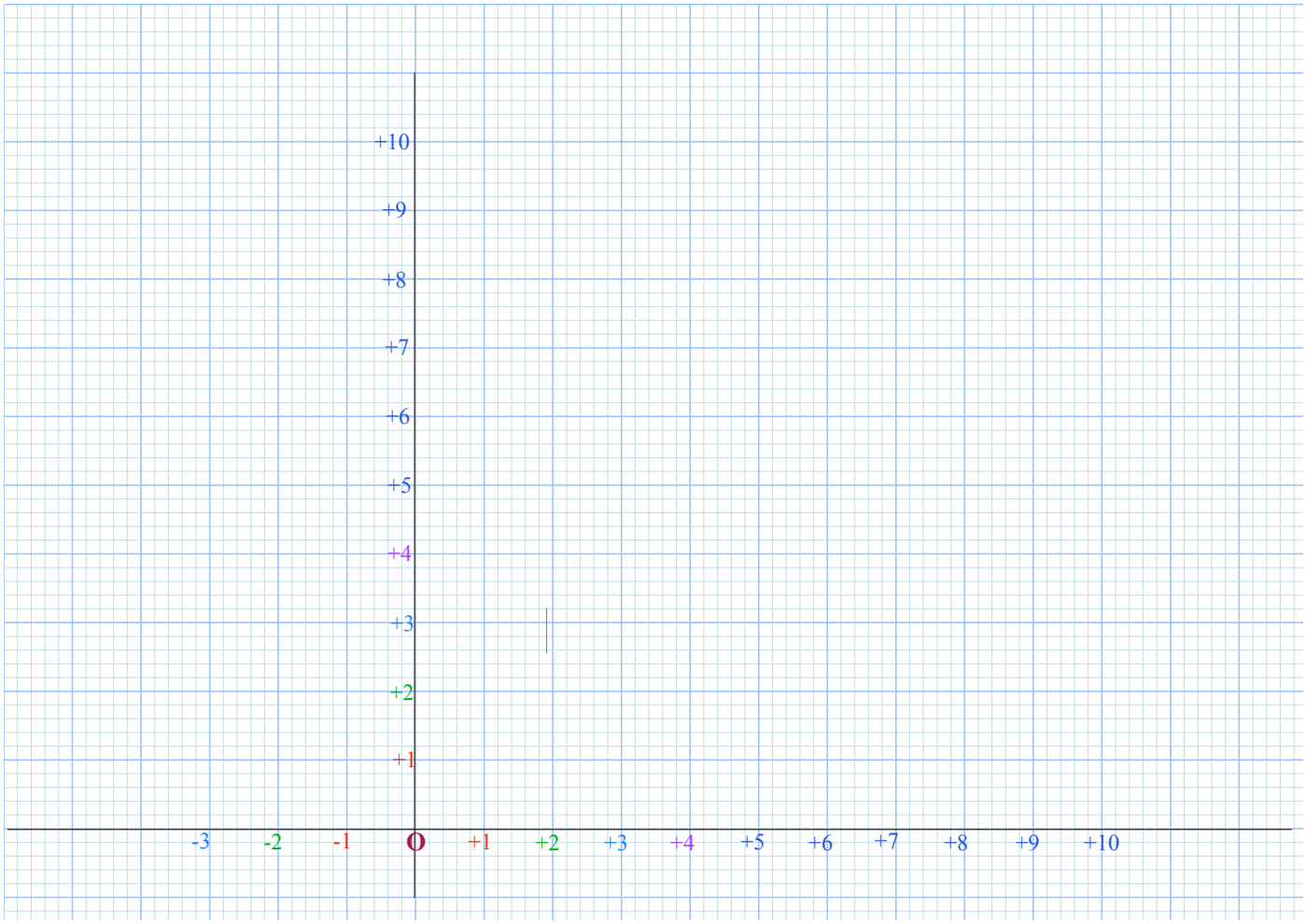
Read Unit 3 (*SRQM by Ruler&Compass*) thru page 28.

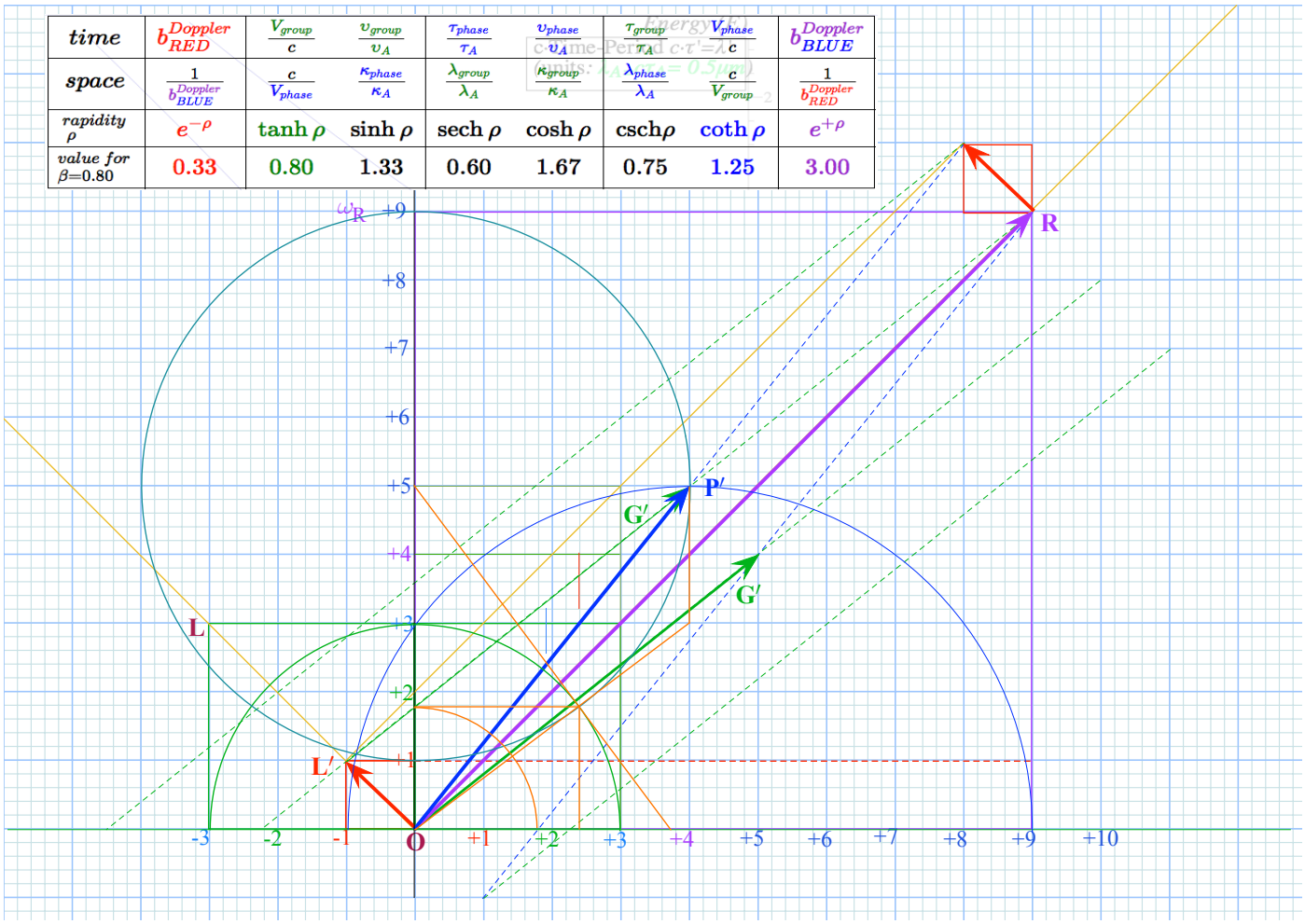
1.In class† we constructed a per-space-time plots of relativistic parameters *frequency* $\upsilon_{Phase}^{2\text{-}CW}$ *and* $\upsilon_{Group}^{2\text{-}CW}$ and *wavenumbers* κ_{Phase}^{2-CW} , κ_{Group}^{2-CW} derived from a Doppler shifted 600Thz 2-CW (pair of interfering coherent waves) and from these we found wave velocities $V_{Phase}^{2\text{-}CW}$ *and* $V_{Group}^{2\text{-}CW}$. This example involved an intrepid laser jockey Bob going along the beam path at a speed of $^{3}/_{5}$ that of light relative to Alice and Carla's 600THz sources. The Doppler blue-shift factor due to his motion was b=____*?* and the red-shift factor was ____*?*

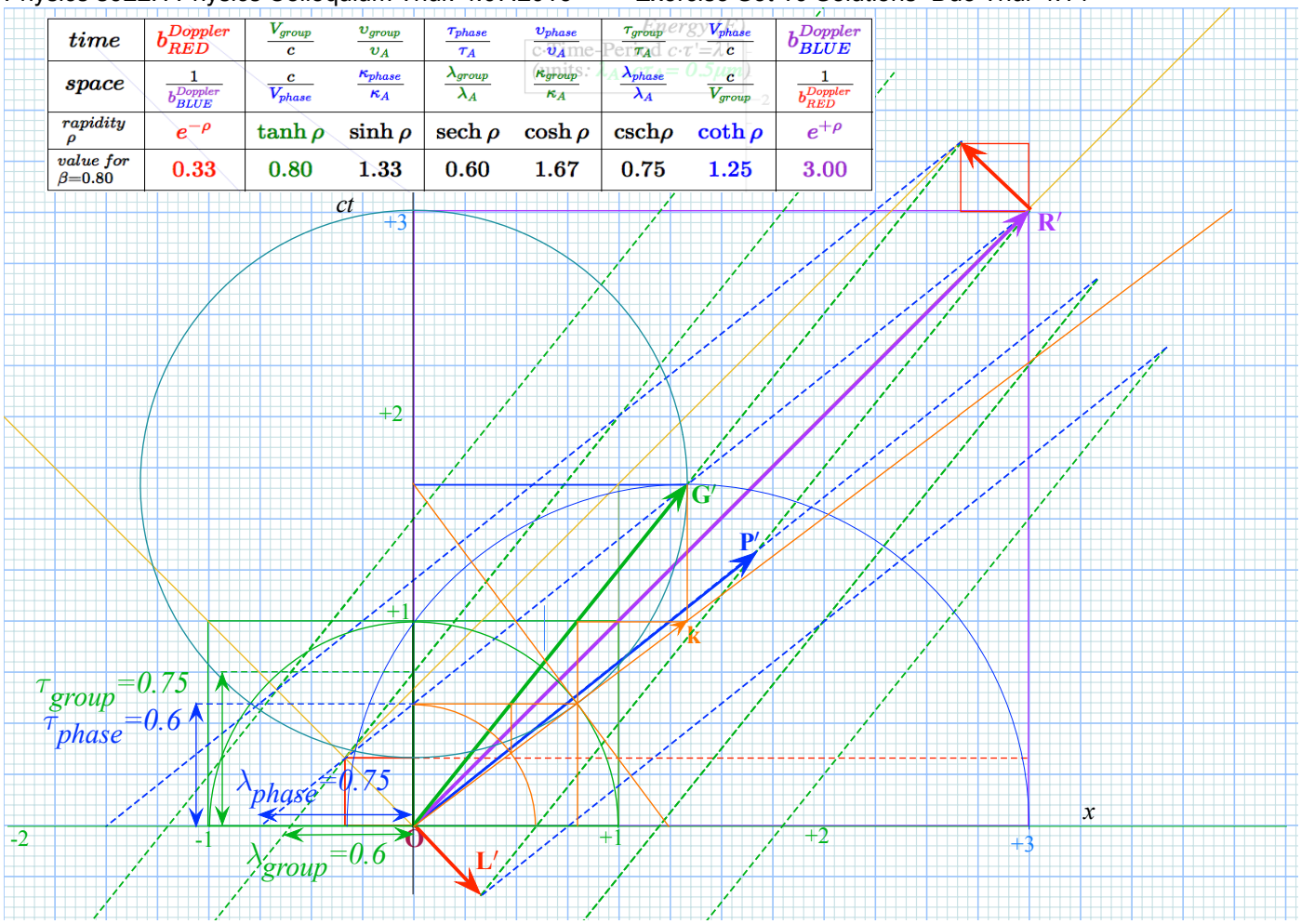
Now redo this exercise for the case that Bob has a speed of $(^{4}/_{5})c$ relative to the 600THz sources. Use per-spacetime graph paper provided in class† to find 2-CW parameters $\upsilon_{Phase}^{2\text{-}CW}$, $\upsilon_{Group}^{2\text{-}CW}$, κ_{Phase}^{2-CW} , κ_{Group}^{2-CW} , velocities $V_{Phase}^{2\text{-}CW}$ *and* $V_{Group}^{2\text{-}CW}$ and inverses $\tau_{Phase}^{2\text{-}CW}$, $\tau_{Group}^{2\text{-}CW}$, λ_{Phase}^{2-CW} , λ_{Group}^{2-CW} and Doppler factors. Make table of numerical values and general case formulas in terms of rapidity ρ. Check these numbers against your graph.

† Class step-by-step constructions are in Lecture 24 ranging from p. 56 to p.60 or from p. 73 to p.80.



Better version of graph available in class or online.

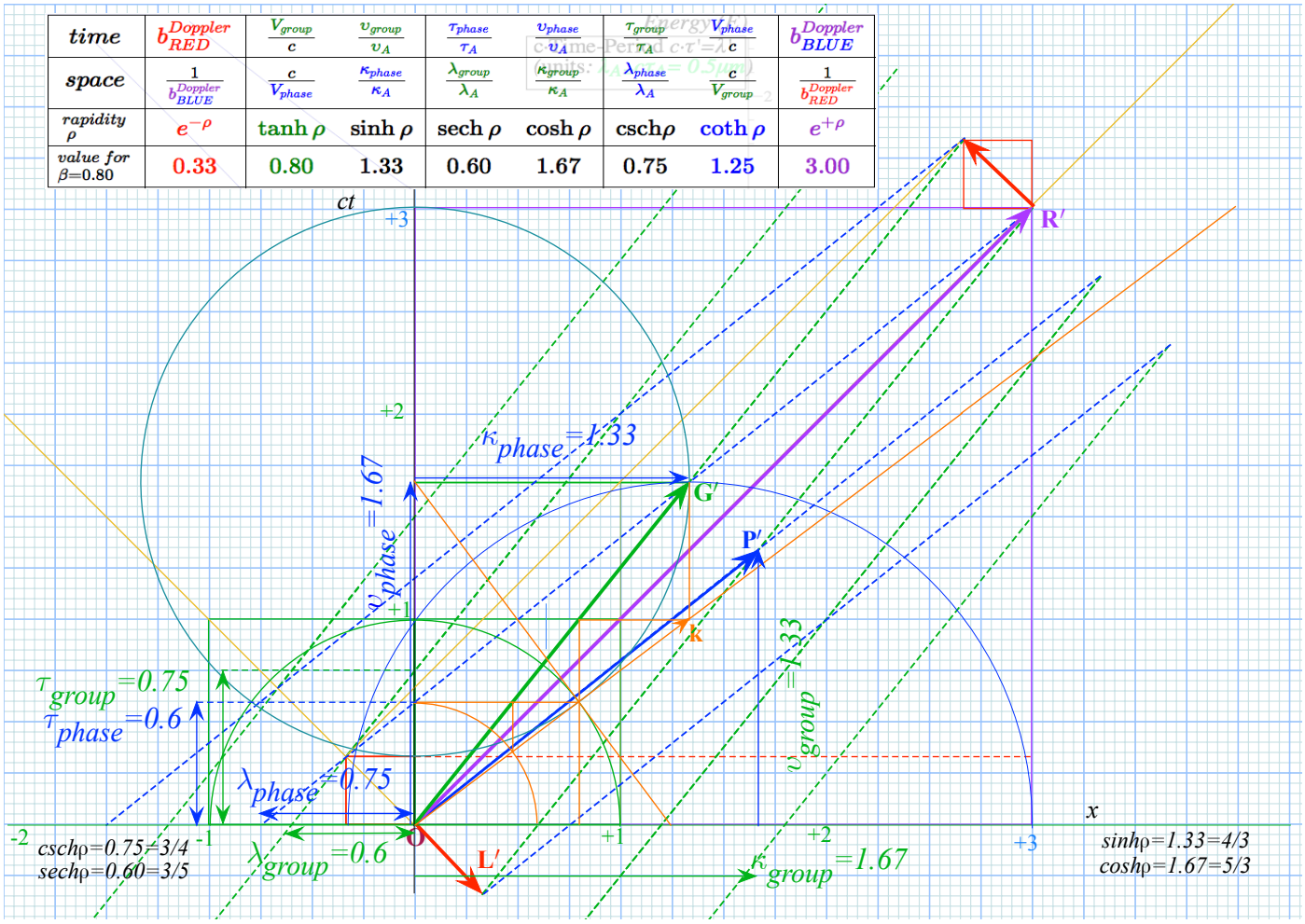

time
space
rapidity ρ
value for β=0.80
0.33
0.80
1.33
0.60
1.67
0.75
1.25
3.00
ωR
R
P′
G′
G′
L
L′
O
-3
-2
-1
+1
+2
+3
+4
+5
+6
+7
+8
+9
+10



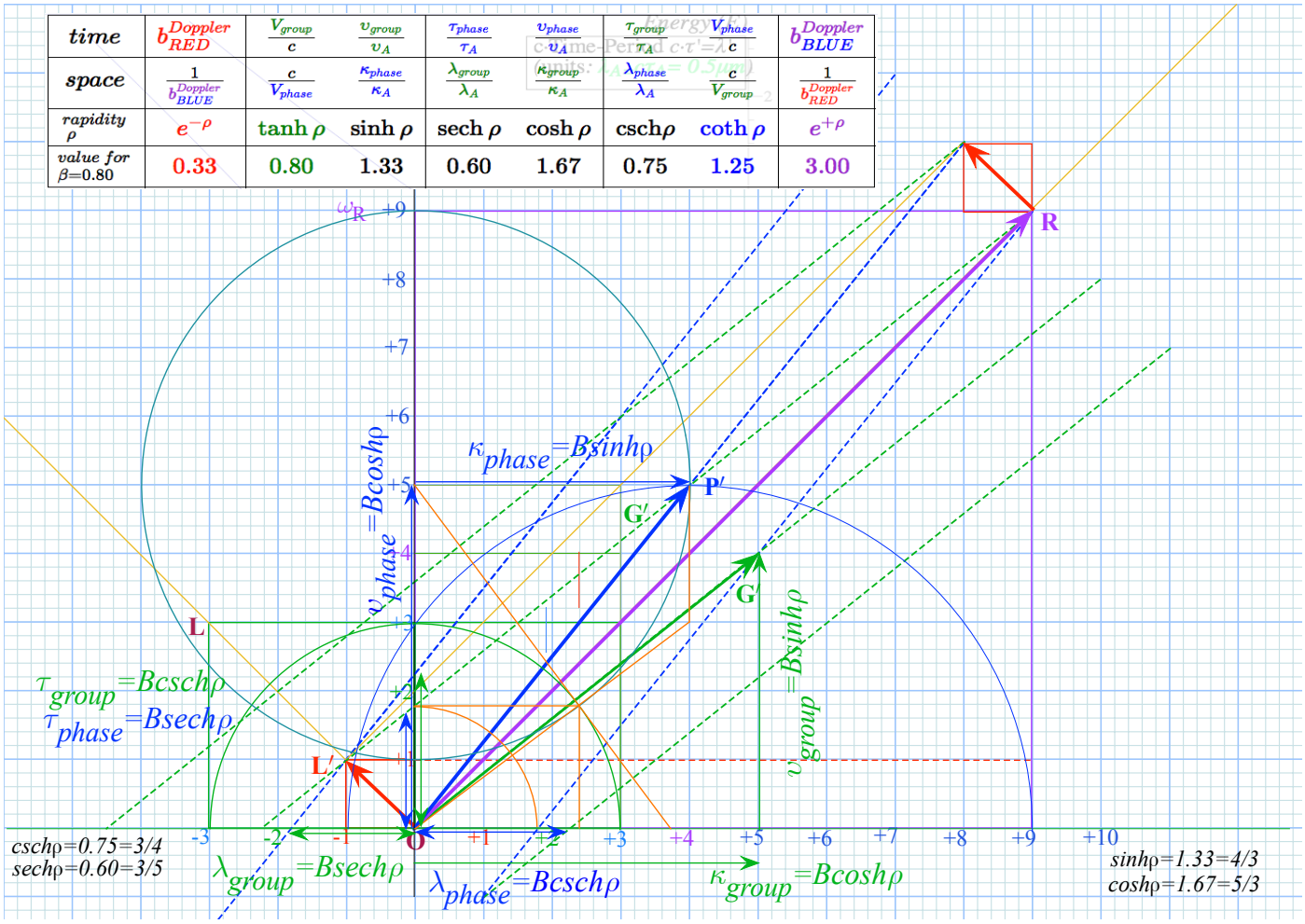
This space-time plot has the base circle rescaled to unit radius so the dimensionless wavelengths and periods have the values listed in the tables shown correctly on the graph.

Note that the phase **P**-vector and its dashed paths have switched with the group **G**-vector and its paths.

The stellar aberration vector **k** has an angle of 53° that here falls below the 45° light cone line.



This has all 8 of the wave variables assigned to line segments or intercept intervals in space time. This favors the space-time variables shown left of center..



This has all 8 of the wave variables assigned to line segments or intercept intervals in per-space time. This favors the per-space-time variables shown mostly to the right of center.