UNIVERSIDADE FEDERAL DE CAMPINA GRANDE

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ALGEBRA VETORIAL E GEOMETRIA ANALITICA

Produto Escalar

1. Calcular |[https://lh4.googleusercontent.com/N_GUtAJFTDCYDu4L7YZjykfJdbpBI5hFMXq9f_uF7qwdsX4rhwiRcPSZD_vR4pMQNmqKaikYEUcGCwuEUrbEJviJYYafh5EbHUQcKMiiHYk4ECBTtS1HTQDE8Jp0t5kT5IYXq1YI](http://chart.googleapis.com/chart?cht=tx&chl=%5Cstackrel%7B%5Crightarrow%7D%7Bu%7D) + **[https://lh4.googleusercontent.com/dekImUcAOq-A1yH-qzrhqrwqx-SeIpviq6cUOG9MY-raHq8KflJ088AIOrivdQewhdm4VoQASqJ9fIoRbLY_TyMG_npT5f-bLbySkQffdTaSAuRWicsjwEoeP2ym7Y9IOsBaGvRu](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)**| e |[https://lh4.googleusercontent.com/14ABcvAsJ4WbOZ6C0UdmiQIG3X50Ad7AJnoqxd_gvbCfEHqeiTRYTjwkrfi4Eb8XE0TZaXuvxouO5p5iK2gv0hmAWgaem02bG25JHe5SKV3ZZbJZdGdU1TFZZ9lfds5fyWkdnK8c](http://chart.googleapis.com/chart?cht=tx&chl=%5Cstackrel%7B%5Crightarrow%7D%7Bu%7D) – [https://lh3.googleusercontent.com/Et0z32KBOR-BILuo7JtFbUE9JtJphIZ34XlNzANXzdN4b09YxbYsdH57U7ivrYdRJvof4pPUxPAjL453Z92IX6vyjMliSrJ1T9KP6v_y8tVQbT7N-PgCZ0WDaP7wIEyoSFFac2p7](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)|, sendo que |[https://lh3.googleusercontent.com/pf76NMvBMXosjC9zPPW5TFJSljEtGlcFKUqkBxSNENVIZsS10yxyitUA0PDdiM9OL_XKsSf6tMBZZSYVz6c1j9REZVkFAbSvCaKYZcHpZLN5yVm7-PEbUKl13hXcqabvI2KsfDCM](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)| =  5 e |[https://lh6.googleusercontent.com/z3lrpl5f3br9YRZlVtWFY_yoWMQRTDxv4a3FFHcYGrHsz2kBAGb6Yyeaj6DlClDKcwiTvUpmpBe2AHhYHNyaUaqgVwV0IirWq5cfedEYB1f0oIlSGmo5NUAPWvPtQ-aW1hv1LbZZ](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)| = 2 e o ângulo entre eles é 120º.
2. Dados os vetores  = (− 3,1,2) e [https://lh4.googleusercontent.com/woywsl6KcvdnnQV2pjxEZJa9aKwoxlut8Y5abV9O2qwrdcOSaqEWFK6hXLOnFcJ0LEufGulv4mfZbULo_szfVveb5BYnu03wJA0Y7rvhWJShatrXSdv5MXrOIi1e9j62RfcAG69U](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (-2,1,2 ) . Determine  o ângulo entre vetoreshttps://lh6.googleusercontent.com/KDzeQFi81inc40UGyQqmIp9SYUdf0EZyKvdC8vJaF1oxUuMVYRP9YkXdQt9O0VSd9kjxnpxNoVZShvsdZoco5IUQ3LQQaqauadRUx1451JraSMOGvxyNGYINXLN8R_zbUsRIujfD.
3. Da questão anterior, determine a projeção do vetor [https://lh4.googleusercontent.com/ma_A3m4UjR6aLRpN_tnXe6iQV5SXSpcn-0aCoKJwY0ghc4ibqrqdEBUNTd6qieiyhPAtxuReO_snsV0Zvv8lr5ITC5ccILICerdBlgsJmBo9f_IHAlaxBpCg1Pit3KMYbPj-d8n4](http://chart.googleapis.com/chart?cht=tx&chl=%5Cstackrel%7B%5Crightarrow%7D%7Bu%7D)na direção do vetor [https://lh5.googleusercontent.com/4A1mYC54cELKW_YYc6-9DGN5kPLhlpuWCVvIwcy5GFyg4ehc2XGIPbW3QV5a_hrM8DLnN-Mc5lDlPXlcsblmHCWFe6A_wgTZy74rYCvOWFZORILpG1UWmhAcqWwYLst9yyXOfOLT](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D).
4. Sejam os vetores [https://lh3.googleusercontent.com/HM-zqMBtSlUoG0mm25RcyhgH2yo5LoQGaRQ6bc6QjUbojNqjTisUnd8hO5kNfLHR0cvkI91ZyT-LsxA3pu805Q3qG0WiEmNVlZmfuZ6Jdc9uIvmjN0r1Uv4S4-8yGaNKOE81I9UE](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Ba%7D)= (1,-m,-3), [https://lh5.googleusercontent.com/RmW1h512RSox_2cZr6G_cDIxmk0_eLZsmvHcghAA-nu9TI4JPhiiPUHi7DIvUYlPiDesp5LFsJ8249BG2EtcEo1e1XESLsO8wJUJ-zPH2qEJQYLmjCU_Q3KQdvMDLZsGoLtvVW2V](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bb%7D)= (m+3,4-m,1) e [https://lh4.googleusercontent.com/ClDtN35DL9ZeEzqPV2boPAN2hM-olKS_xAGIVfyA4rU45Bj8HI3drcGKO9vVfUbhqcNwyBDjF6lDU2D55AiNpPn_Uf4jIKgQ6gxitJPS-HgQdYQr6fLElLGj6ZZw8NAzYJLHzQ8B](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bc%7D)= (m,-2,7). Determine m para que seja verdadeira a expressão [https://lh3.googleusercontent.com/gB0JChVPCTxrMaqdrQPt0ToJlKyRF9efUOQQBBXI2uyW1Bf3wR6er-GcYgouq5hIrkEOp2fX8auvsRUutAMxacs3kU_asYr75x7qolJ_ZazbFuCYRGdsaGUSmts8GTWKxCPz5qAv](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Ba%7D). [https://lh3.googleusercontent.com/kVV6UdSZCYGaWcqDgnA-zQ6izQx00VB9XwSpf3nqtvW9tM-B5Ph0P9f_foCN5CDhZCbOXiR6qbgVtgxBq7zizIvOhSVJ2A6DbJgXu0vJwHufi5unricXUI-sQ1YzknYduEIf2Umf](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bb%7D)= ([https://lh4.googleusercontent.com/28RxmiVz0LwFL3bQyqJIyv6rKlrkpAC_V0qDQBUW1jVUj5xtZ3-uR8vFY_nhfWF8kPG-kaouWqRJVhv9GKWMgGcHPTr82zyfNlTRYPvRymfBlySIzftzsssVq-Qi7FWOMjxFHf1p](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Ba%7D) + **[https://lh4.googleusercontent.com/8uMfm51z5qPJG88nGKLg5Z7tfdA1OLxNQR8TER7be7v6xh9LUtVl8oz58TZJQoQjQMJ3fONYVcgmbaakDVoi9PCLEvw-5WQiWM7Q8E2_RedZNeJgmjrf9dxWGjUaBlVXXumErWrk](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bb%7D)**) . [https://lh5.googleusercontent.com/8Vh2-90FI4chSFCmxSoq73hqqMkLq-fbXAftKbSP1j2nMXFs36Uj05Zc6jwMwqMz7rEQ-f8REIaMuXesI0ycvBde06JA_wDCSjz-xSXsGohzxCHqxf0P3MT7ATxvoJ1D739f0ZFR](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bc%7D).
5. Sejam e dois segmentos paralelos e de comprimento não nulo. Prove que = .
6. Calcular o ângulo entre os vetores = (1,1,4) e = (-1,2,2).
7. Calcule os ângulos diretores de = (1,-1,0).
8. Obter o vetor , sabendo que | | = 4, é ortogonal ao eixo , forma ângulo de 60° com o vetor e ângulo obtuso com .
9. Dados os pontos A = (1, 3, 4), B = (3, 5, 3), C = (2, 1, 6) ,tome [https://lh4.googleusercontent.com/CtlKfxYtlrYXITJzTpkZhcKbQ8FuCBT2avJn0J8axv6PsbVYaZ4BJ8oWiVvEPCZrsUsigA2WdOqLmfjeWPIkRbGzFM4rrkh9hc0sp_17iyVI7muTJRYrk1M5Fdvi70ndRv4aVFXB](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= [https://lh5.googleusercontent.com/LaOtMWIGFciz5KODFiQqBY_LTieMmpeSd86RGY99prgezC1w75t8Lv9_x3bIgX9YJDD1i81pMOWvWwKAgZWWObJwm3Fky_qpOE6YHlWdL5n0bYICqXrybeiERQCmiO5HhrxDMjE7](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7BAB%7D), [https://lh5.googleusercontent.com/i2X6BgKMAUoZz3RnCsylWplDxjPuxQ1ITDwZUbR6sQ2YPJ9_hSyFgj0ZlqUJkQJxBGJbdxpcKKtSqdM-iy_XSfBXsJnBqu5tkE4yQ0E78VsjEmCFFuwJLLYHCB7klq6W7uMCR5DY](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= [https://lh6.googleusercontent.com/4OgZh0EtdlLh1aZHcWGpX3ZkdWzsq2N-OxvLwn7btSPkAeDksaeAaMeVUFGly3-OWTN64Pf9d9-93Yrzbw2E1sNcbi622mIx3iNRCtOcSwRAulK5sAkOVcJhvPsaHecMAtypInsi](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7BAC%7D). Encontre o ângulo entre o vetor [https://lh5.googleusercontent.com/VDokHMA0jBx0wzm9ePTQA_VWiJ0h6kA7Yz11q8B0vU-plp8e4LqvH1a4fOFFxIunsYQhq420LWLjUXTK0LclpV1NoUxUSfL4ZhjrF65bPGrbzddoO_ZIPDNs2H1K3FqftHc8TCta](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)e [https://lh6.googleusercontent.com/hnNUNZH5efAxVe2mH5s28jclZ_ZL4EXyb4t09Wxi1yiQY54BDsbhs1VcQYnQRshskX05NnASII8VAfOimOK3cGyuu6zYaTxuireM8K0rCsMjCquAA1cxAYhI0-cp14cE3UGlc3iH](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D).
10. Sejam os pontos A(-2,0,1), B(-1,2,0) e C(2,3,-1), vértices de um triângulo. Determine o ponto   H, o qual é o ponto de intersecção da reta altura com o a reta BC.
11. Quais o valor de x para[https://lh4.googleusercontent.com/PKUPgNYBqB0Z6nfPm9SiQ-VObi80VuKpHhe65zIAg_17H24xPGGlbtUKu2Uiiev7jkfCAJp-zInNP6Qr3G1RNwj4bnHZQ5frOGLjSLutBQbpF3kCMrQqrqK02hyPPKSu2kjQoIu8](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D) [https://lh4.googleusercontent.com/WqgpvqYVeZTLgppIDL5v22w9a7ui_FEJWBvEIAVWBGQrio9gbe9KoQIPKDX9sjyLBFzx6VdffL9cenx-C0tvF1tCYfWLpN8KPhhzm-M_yRGimvaGYhYj1rj_md55UIos3wELh3nl](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D). Sendo [https://lh6.googleusercontent.com/Tt19yhqQBi8tmAIkSyMOukrZAGFTIuHAkRqfzf_2DEGC3n29XaD9FMGmTdrv08Wg-_sN4BgPiZ8c4kPBJFnEmiLkBL172WDzJFrkPIBJbn65eU5WrsAb3qn_u_E2cN8RgtXRVCdA](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= (x, 4, -3) e [https://lh6.googleusercontent.com/Ked27nc4ciRsHfq3AHVGdtOthyAxPWh1OY4cg1o9tg1Lc7c_38jarVUnwuiRTvjVlaiPzfBaaRDUL_XmvM7iJmcWdDlQNGq6xgDymaA6REkn28X7CdMV8YTepwwPsjGUdl4QRI84](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (6,-2,1)
12. Encontre o vetor projeção ortogonal de [https://lh4.googleusercontent.com/t_q8YYDMcNxF7bmIX9j3_iqNcYSPYwCDmoeWGIbMI-yv2cCq3NOBODl8hr2vQ54cRQw9K6c4FK7SEDKcSES-JWjRQPs8aToVYs0U1u50KZxT4EH_aLr1HWmq6b3HtkzObHs8Wlfw](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= (0,2,0) em [https://lh5.googleusercontent.com/Q963aH8fIlhkZBWxJ8iADOBfuwns-TR6fqN11KN8xo2bvOfmNqT_leZ7-he1yuoLQnY87UEzH0NWi3Dcjfur58WDCqL-v9AYiRu8n82oXA4_kLgBs8QKeKtcJbI1AbJerA4CLGwE](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bj%7D)= (1,2,1) e decomponha como soma de [https://lh3.googleusercontent.com/rWkb8zl_fx9HMyiMV9NWcCj72pSwye0MwgBpFwMnKNrRdyYxE7-QepGvz-UvDAofSyL3MLUz4lwt_ph_6ewD45Xckyrj6HcXGl0yNXK-dKo4gyi2ppjqLqwjZT7g5QjBZLS87RSI](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu1%7D)com [https://lh4.googleusercontent.com/R3Gnuu0Doj6uJKZ5cXOQf0iGmyBLCXWQW2hmNLsi1JnUMnkUjKp5CQcOU0Rt5cKhdHvAbqvQEyKiYIfdarJ5HonWn_JRNecpmVyQ4A3qE4wLoxHj8Yhz-UDw2jZWzRV_zUvLYTxl](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu2%7D). OBS: [https://lh6.googleusercontent.com/o8Lc3TR5immimYWb-AYNNC_ifhVK4Nem4lZumrtxw0YLazXwwLuwwBdzfrwTmX9HcG9jWEp0LfvaGDAAlgYNVxiEFlwguOZPg0hQZ-sM_rr4TAN_YBw-TWIdC2eNZzCDXiMRURiz](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu2%7D)// [https://lh5.googleusercontent.com/FUIYAYIbXqRrav4YyaLrPCSeYxuIWo6bXh4i2F_KRWzeT318cuglP2RBJv0wA9YsE9fXw43nmYiYqzl_NihFXM4CV1JkCXDOk87AiSUTvWPKOXTHhU7iC-0jFOwJXbEPcxrAhFP2](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bj%7D)e [https://lh5.googleusercontent.com/7SmQ--zefA0o6qPJSKPyvw3rI0pZX33eEu7eH1VYdce8rTrg8QITeIwfzL2bkESVpsPh5_pLBSqegFE6Mz6nq0aY74GMU0MNvYwYlkgMtKWGIZtv4KFC9N748vXgtYjSpdLVMg3x](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu1%7D)[https://lh5.googleusercontent.com/KgxNCx-iYggCzJTROwpjXYpXIRXqUZET6cjZbHmIC-iKbpMwC3Y6Rignj4wwilaZKQJhgnUxk30XsVmwyN2cZzTSYG0iOh74WfD0E_5ibKR5v5OADCq5frJcb8Do0zIsr-ux77-O](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bj%7D).
13. Sabendo que |[https://lh6.googleusercontent.com/l-O8kZ9i1UskB6rdf7TogovmOkRAjPGDqVA4nEXG9RGPpaTFFBq1J-LVgseSKNkLaHdRPrd1_E8VRTSSX-yxqhewW3CuJmCSfcEdjnAVMX0Nwe8M8V0L4DnpfOW0xfyMndLt5kQJ](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)|= 2 e |[https://lh4.googleusercontent.com/XfSY87fwtcAbWFFlwBzs2SMbJm00-9sULJ44cXj4iviK3nm44xuXvK_6PdBcZtpcdUDinMpzbWGoJVm-rij40JvpzSG6om9TdPchKBsXMI2XculyEthPpB2SUg_wcyF5igO7oTTA](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)| = 3 e [https://lh6.googleusercontent.com/-CBJpC2OLdIFVv8LO7OJj2zRVw9hA-JbQrHyZB_s2BY4EQQb4ATjdlIHVGFBq_XUxxD_laNFdrY6QPwrVIt5BIazlIlXQGY0arEFnAAHRdt3vX7W5UpcnDjzugnkRNcYEq4YoFOG](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D).[https://lh4.googleusercontent.com/ZOvN8_Oqv3VdxnBWrOEt7B0LPEZ1A_HvlBvtmoWwiCpOkui8l6cohaphJy43iR7Pph2pSCe5wAZGKj2lRxX7-gZhgCaBK_duzP3s_fBodRmcVbSpcoxgfMnRbey4u0T53O-JJCAD](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D) = 2, então calcule (2[https://lh6.googleusercontent.com/1Tox48NKfkWt_sfEsGxTjUyv6NHqP6PZq1dAeCU5NhN1jn58VGByQidjOJhlueTLFQGm3JmEN0I4WNRjodLdkmjs2jZ2JvxFtGhel7WxWB7bHBAvq90xWiQgQBFKeDfOUTl66l19](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)-[https://lh5.googleusercontent.com/nwytHyNaFnDvo7EMlb72ibbl7EReph2EAQ5h08TNKr8x6f1NbsIQ8giikPgu5m5ZQQwBSHmlyUJeeEfdH5pRWasy6cDI_F5HtKmgCVUpvetN8Vmat3qVLSyutDFDnN_Y92vvRKuP](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)).(-3[https://lh5.googleusercontent.com/BtGQnyFf9lsLXSAk1nIPKh88K0irhinukd30cmJLgcf0r12JdDkyoOkqKBfoeIyepo8hJvGx2b3D3BpyoddcobEl6p7OHYgzB-uITFGaRNpUfPYLWHbu80WfMMDODnkumWeAVBDh](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D) + 2[https://lh5.googleusercontent.com/6xSHIobAjX7Nyg4HSDn9jRGsSvBKKMGiHOfUkho4FRviDxyTVzoA3viQcyvUSqy_ewvdCwRMdKDhqBe_kkVVDafUl_WFo2PLM397V3p8imY5XW9fzQ5qb9p1gTpYXTmrlLrlMKu-](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D))
14. Os vetores [https://lh6.googleusercontent.com/uH9zKD_GMRaj9eyTnwXGPwZwkzkVwqp-hJ3JktfvurG9M6eJ3WvUueRhgbUE2qo51D3x813mjmFv-EUg1LpSrrEn3gsVuJJjG2RiHEjKW55P77yfT2pHbp9lMM-f0gLP2t4zx5Ze](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= (3,-2,1) e [https://lh4.googleusercontent.com/c4HquOKtNvJKFIrKgqewuXE0sCn3udawSn4OzDJCN_61D858EU5G6ZAh3VL0cQFqYqHqYidjtV3ElItiKfy7hFH3k6hinmLkSxaEmh0ah-Qmae87bteUV7YD4ZUPuh2ZccL19Bpb](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (2, 5, 4), são ortogonais?
15. Descubra em que ponto do triângulo é retângulo, sabendo que [https://lh4.googleusercontent.com/5pIVW2o68lQl3hLdbuxAnvYElZ7JWCVNTA2wxJ_sbKlLesjthKJ7x_ag86q-ABAFfIIDxKHuLUkjG0NQNA1iPPYGfocneLrbyHfVhtsEmeU9iuhv6-lSjLk12Ut90EuuBIs2MpJ2](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7BAB%7D)= (-2, 0, -2),

[https://lh5.googleusercontent.com/jDe4F0WVJChubvzwPV81ak6fZm1UN25ZKPYB2q9r8MYptmgSqeq8mk9fdZtWC0e4iNu-12o8UjdZHpaVY4ftRYb1x2DkMuTVjziTcnPsatyBuEZ7fFt94J5eGUvD65N-ejfZJb7e](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7BAC%7D)= (-1, 0, -3) e[https://lh5.googleusercontent.com/H9xacc4j0xF5KWihPjP9S7WBBbLSrXuWPQX4RUIlXdZZSN11cAR-NgeNbWSA2-3pbScMJ2rY7aM5QbBa8SO24Oc_OF7K8ha_G54qlzMAI7Z1M5AV3Z8JyohsQ6KGKD4ROYxvkY5u](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7BBC%7D) = ( 1, 0, -1) .

1. Faça a projeção de [https://lh6.googleusercontent.com/E1DCa7daQKfBskShl65aj03EJ0k0yQdFgaq3Arwx_uHhbReZmOJWI_3pOyFF1tENjZ2qEdUc2csLvVGf91OT_C6hXLcoKcf66jQ9QX1K2wph-1NgQYcPnNof84lz533G-i6KVDwC](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (3, 4, 2) sobre o vetor [https://lh6.googleusercontent.com/4E6GdD8UXhXseuhfNJ9DeGFxlle5TQDC1-5FW4qlYf0GKj5Asgccdf3_bbFPh0pyxLv-G05yDGA9efnBvdDIL7RVYVgN0q-91hEZf5SwkXQ1ukkoFBmeXDT9G7RjZEvqcZH93LYe](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= ( -1, 0, 1).
2. Calcule os módulos e o produto escalar dos vetores [https://lh4.googleusercontent.com/g4HtpJnA3qFFbOwAgEZOWH2ya1wgDCuDm_aDgtGqNyzp9enCLaLv7_bG8-aYpcZcNbjDm70BpoMc3Gag39ZrcciSVdvUsVelkadqTougrLin9JEAkcJGTmxjGWN95uwIjemJQcOG](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= 3[https://lh3.googleusercontent.com/w6e8cJujMIm_Df_SMJ6LlFRb3yBdPOwwLUkleDOmi7eTD6YhxYvCWv8KQX6zATgxcLqbxf8VWqci7M9qTksmi-soUBFq6OriJTpKJQ0_umwDJzGDow3QgxllPNOWnZ5irhV7mqs8](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bi%7D) + 4[https://lh5.googleusercontent.com/9aREam3X8ROL5-IQYzhHTYQrru271yO6_3mEL43rr1B49M1P1ZQGDqfz5A-GkbqE4WSuKT3WxiERizfc_dG8qyfc1ehItJ7V0EqtD4a7dcKeSxv4A-AiIqs0K90jObg99kaTMJSI](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bj%7D) e [https://lh4.googleusercontent.com/MV-u4If_5CR-xedtcybsxoqaa30HUMIt4bH3MKcMofPq9k6auxuTllWNlpMj1l0WXwX-U76enXpPvIMhwA5B-Mu42cGVrRZWmg-YbLMC4llJiyvDdcekaRvBbv48xKfr77F-WJXc](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= [https://lh4.googleusercontent.com/clsty5DmQnHhoDQIdwgJ6rSSZcO2ABvkSIRCG4k6-JUnSGdV78YeNCoBxmlkZDnBjVSubQIVHkm5KiJyd_w-Bpk8w9XPqxaj3NfSTPAIQgroWwaR2cXXft41_8Z5mFn2Oatn6BvV](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bi%7D)- [https://lh3.googleusercontent.com/Bvu6twPP_r8XTyxGXqaKx2j22j0tMziRJw3s4JONzGmaZUzL9mfvDib43GsPlwyYWQcsUcrTBw1WxIaZW3YbBLLCbX89X9f6iMk4bXz73tKhi7cLOkwHXEbRvVgaRf7ouiOa3txj](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bj%7D)+ 7[https://lh6.googleusercontent.com/-VxmKaWjz873gjZdDcsJpt37GZNdsir1PUzAxzJ1LVHqxB202wH7Ffku3hNDsba5Bw-0lXZQ-rpHJRQTUMNCwYu2WQMOpnM_fHqtCehHvd7LiEB6kBGToDWaYf33h1a6nS82dfrC](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bk%7D)**.**
3. Qual a medida do ângulo entre os vetores [https://lh4.googleusercontent.com/LAfQI-9FbTmm5IrKq8MYlpxVJIKSg7gl3T0w7k4bjcXem8ru7KNlkSfBLrVtQaKDyoguXaWGveUby5VXmvVJ10Ib0wQ5TsDzL7or5MHTUo9CUXYEi8osicM3rCUvG7oi5w0pTt3N](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= (1, -2, 1) e [https://lh4.googleusercontent.com/jqDncillEYcuVM7gjEup6bCNrqWl7O2yEZpDCVucaQ0fZmT6KtlYXi7W6PSBuGe-c_rpKotths5zYM0Ey9Lz0xW_s3N6qwPe1_tr1qBg9Hhk-hkC8d3TyLXfVkSnaYQwhqUdSpz_](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (-1, 1, 0).
4. Os vetores [https://lh3.googleusercontent.com/kmYCRt8vloCABMgaI3Ru-KeSBo27NbfaWRxgXeNUVdH6ndAIcdLdPgCd7JCvDU4NshO1Hx8zVFGEYxB3BqeOPONb9l42qgFNk8itpVDfPTrDlKmFwhxEVL01OGyuwiKujDQTd73K](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)e [https://lh3.googleusercontent.com/4wm_W__6grF3zbJE4aZexPw-zRWO5is2qCQIpZ2ogMAWhcX97Sxtg1Nv3YjegYWAEyOQfeUnGiTEa2Dk1sWO4UttuX_bIttXf0U9K4Cjp1xc1OUVwsfocV0Ne9F7N9ovJ2urCJzi](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)são paralelos. Calcule o vetor [https://lh3.googleusercontent.com/n2q0KbRWKaAiQ9mqgt6UUSxQQaz9X4oiYQdrA_mJ_EmTpIAULcnuclYjFEh-OtSPFzQj1MjeSLPB8yAWAQ5BMNAIuQc_VXF6yfDG7n1qZF10glfLmRHcVVZWe0B-ymuezja5P71u](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D), conhecendo-se [https://lh5.googleusercontent.com/opF0S-2OFFlFHu4UfDEM-v6eHBW7pi-FCkazLW7_Hsud9Y7PO8_IugqAAODb9zzbc1khIh3VXNyGkaepy987eNBgng2lVGbM7u69mJKKj5ecSGZBZwZsUl_fSIBwCR8OkOGPdVDl](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= (2, 1, 1) e [https://lh5.googleusercontent.com/hRs0U3QpITyfxBL7DzNKnnQrKd0rx1v1M-QDBe0S0uu1OPn372UIqX2dns7eKt8FBnujyswAuS8-58RSom6KjxBu96nh58A3dQ_edy2NUqTiG0m9y2-HcCW6VND19Ai0uI3TkvjC](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)**.[https://lh4.googleusercontent.com/zics_aFIVy53sywm2GBTF0Xfk-xkou3_lG7yMbRWJbKbTWYzVKqDF6XIbpKs5QEsr645ufTWaK_EjZYVW0uS3ZAwQxEWQeIzyrCFOshXCQy4-sYgpSXklX39UWILtz82O_y_nVPM](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)** = 3
5. Seja o triângulo de vértices A = (0, 0, 0), B = (1, -2, 1) e C = (1, 1, -2). Calcule o ângulo interno ao vértice A.

Produto Vetorial

1. Sejam [https://lh5.googleusercontent.com/z-AJ88uEZ8A10OfKq7yQ9wjj0nGa47PwO4ikM2pCf4oUc4PwMe3LO668bQJ5sdsMEd3aHWll68dQ717SOCY35sea3P5KyXqxwcbR1VonuJCX_adqfJ6-kE09jNjb36id2CDrfC4-](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= (2,1,-2) e [https://lh4.googleusercontent.com/hCtXBDBDg8UOUt20at5BWzLee19UEHqelVgqquV9n5WCZJv0SU8edGzEY50ISlRGsJDig0aGnpJv1WPUAhXGEajyKcH8TEUdxcYLRTrFrvTcwlTnqvb7Ojo_j38UDRoVZopXaUnB](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (5,-2,1) . Determine [https://lh5.googleusercontent.com/_uP6t4u7v3PLtoE8IzoVneQtqqQTMkE3OWrD17idj8o6jYRDxlpS-MQWeDEjVbeGc6HjI18A38bQI6FvFKRpCDQc06IK1sqcSWF22iJglokO3HR-nCdPbs_5EJ8rqqTW7_TqSRCv](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)x [https://lh4.googleusercontent.com/iAW-QBVqu7Gb7D5KtWkVlXgPdPbSHbwd_f1zYKaIz_QGsYjEmtBh3tr2fqtjvKhLtIJeLYI5NUIUnuqPPvBDISXZFl2g1efyBNKsWI5RNzcZublZmrqwteELhnrbXkME-mSm48BE](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D).
2. Os vértices de um triângulo são os pontos A(-1,2,4), B(3,-3,4) e C(-1,6,1). Determine a altura relativa ao vértice B.
3. Demonstre vetorialmente que a área de um triângulo equilátero de lado m é m². \sqrt{3}/4.
4. Se [https://lh6.googleusercontent.com/iVgLVhp18O-xpY0bLqwmPEp3GrZmf4kQE6r6lyHQ2LKGaX1pZPTr26-wb6hvtUn9aFKGaESe-2Q-RI9Rn_kA2xJbv-djothRBqAEcGcAWfFeR70OGf1TwdO9eMd3DWAfDuC7HOoN](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= (3,−1,r−2), [https://lh3.googleusercontent.com/mNHHfP3C4hegHsvLoVYSWq5k-X3zfl6Hrs-BehflUckSzyVGB2SxIjdOGO8bpShPWmyhgdR7akCetSirAZB15gAFmXXy9It8_k6WuSK3qPwgT1A7riCpYvNBKgk6XOzOxR9wzcs-](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (2,4,−1), determine o produto vetorial de ([https://lh3.googleusercontent.com/6LobHqmhaUM2NM5kmbWcCkhkcM0E322M73i3pdktockh0yaPb1gUk0GeFI5Up7dpU5u2wQnN9w3HSpUMku5st-5Iw6htz-NgLWJbrUSXuxdKXjuU2HfXiYgt1nRFowKcMVBBYeQn](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D) × [https://lh3.googleusercontent.com/Y8KnXx5gtku_9_885xVeEyqCtiC18afNbW3JxgH4nPEANTLef6vhwGzcpLHOUkWubaSmDYXzvQeZSKvQVKPdFXRL5Bmz1Fas8MG6JlgwOsOvKRPH9JCu1a3nC1SVh1L6KuydqLe0](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bw%7D)) + ([https://lh5.googleusercontent.com/zfo2DbpY0st3FGQS1jKEdW54qVLPXo_hqM_kAn3i-PBUdqP0wgzmYfsvTNvUC1mRVU1vSFhyewqc5Snx_reCNOTYCISRQQcDDW-YNj4SnDa-aboc_XKaYJ-m6GBXHmtIpCf4ngrt](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bw%7D) × [https://lh4.googleusercontent.com/EYHkRU9d5XyM-EkIr_mDnD0R_sBNxj88MozPhmoNkBkbKaEwuR4izGtTgkI6xzVeJ5YTTaFMcHYesRz3mt9EAa3xIs7Gm731Sxj2FxVPTs-Kt22rKFN07LbLCvHOxKUqJvSCOk1y](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)).
5. Calcule o produto vetorial ( x ) de = -7 + 3 e = + 8 + 5.
6. Determinar o vetor , tal que seja ortogonal ao eixo dos y e = x , sendo = (1,1,-1) e = (2,-1,1).
7. Dados os vetores u = (2,1,-1) e v = (1, -1, a), calcular o valor de a para que a área do paralelogramo determinado por u e v seja igual a raiz de 62.
8. Sejam os vetores u e v dados abaixo, determine um vetor que seja ortogonal a u e a v, e unitário.
9. Determine as coordenadas do vetor [https://lh5.googleusercontent.com/qpacRdVynsIsMOjheSa9oQPHb8zY8PoZj_KSJYdfme3_-JFRKEcx79zjw8Ebaewhotu8voS7mlpR1hhn4aMFno_ffybIe3vs4fed0xFZ4VRXm79quzTX73WE83vAUfdh6SWYcFEv](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7By%7D), sendo ele o produto vetorial entre os vetores [https://lh6.googleusercontent.com/UzmP1dd11AtTYnJ2GWg7zA3gEdYmrE4NCTZswjrTjQMEbHdXR2hiZi_d-TJrJY9MTpYlofgF7IKm_m879tzCc4dsUxGlyf5CB9SmFBlHUw075kuox4Mxw7BdGvdrC5h2bMuxdE_V](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bb%7D)(-7, -5, 9) e [https://lh5.googleusercontent.com/F3xK6oSy4fa5V3fIDeTa88LP6j_B3O9gmHrqvtRAWFCt2YBUDIv5Jbg5ZejsssKSk6IFakexspv4NtBVYfYJjF634kl7sZ9N-NLbqJTpQ6fpzXUUqFe5X8rISCtuMVNcQDyf-TQm](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bf%7D)(9, 6, -6).
10. Determine um vetor que seja simultaneamente ortogonal aos vetores **[https://lh4.googleusercontent.com/5R2yZLFQUAUXPynn6QobmDXahbQhJHcfbs_5fGLn-S_3ZNBDuZtYA0c-Mg5fimSPIJaAHdmLHm4F0QvPtQO9AkrfVU72OUChu_AxM0xmkJzBh9qISlXnoxBIwYrAxA152F4sZ4Vg](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bp%7D)**(-1, 5, -3) e [https://lh4.googleusercontent.com/waK6jhHVq3JuRZNDDeBRG9vuLFTzyATG-uH0V48UI2FBWYwQ3EXKExOd_tuHRMPgi7QfLGy1kQcNp09wUkP5c2OUX7FNelDX_j35nESppnMbq8n7KnXecOKq7dh7MzHlgJoja24l](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7By%7D)(-9, 5, 2).
11. Dados os pontos A(1,-1,2), B(0,1,3) e C(2,-1,-3), determine o ponto D tal que [https://lh4.googleusercontent.com/mDniCOyOqq4yo1sJujH4XVQSWyfB_iVLS1z-1too_qwHvx0cMbco5j69jgB0JcjNGKhBOtFia3zBHJ9Pm1_zBhCmj1WU1Ifhc3WAfbrw9nooW4xMjQyagQ0TVw-0euQI0hTbD3Xo](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7BAD%7D)= [https://lh4.googleusercontent.com/U_NOKwrWxIYEfGKqAMDex6-_Tnmb8XUIdMDnsBZYeppiis45jpsPJU_T9ktp5ez3Xeep7jtOhYQJAsCB1NtC1f9N2gW65rn4cx_r9UdXdidRih5B2ViSMbmqb4HDp8m_hUYzX-0I](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7BBC%7D)x [https://lh4.googleusercontent.com/9eOx3_6FsSZc-d7u09EtqfqzXx4rG-v_zuXoZKe4p3ajV67Y0ZkN9dD1dnRMQz0nQaxGTHObf8rj8wtUcQH09I51nA31rsXXNoiFkM4B2bOVTSVBLqKKssWat5333srgARvHjuDy](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7BAC%7D).
12. Calcular a área do paralelogramo determinado pelos vetores [https://lh3.googleusercontent.com/ShYX-xM5JQ6AkmgIHnl9sLssyc9kvcUwjCQrCZKQTQxygXJzabGe-KPGuOMBocm77WBgvy8DKBqu3My-ORNSQR9hQVaoCBp_HmOyY1oxoWTrPoD9MvYbSX0LhXfkILhJxHPOG9eZ](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)e [https://lh4.googleusercontent.com/US5fAdWuONTSalX0EDhQ4gDjelox4FCB69S7I_23FrGWoLtOIbfs5KOlZqRyHAv4fse8K1yOuV44b2osNnII0timXq_q7EUdOl_ZRVuDjBOjq90UhmnZnTqmpqVEU3uy9-LT-c55](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D), sabendo que suas diagonais são [https://lh5.googleusercontent.com/HNHPoUh89LoNveEnq0ZF3q5D6MP7m2Z2sEByXVAAfUOwXHnkQsMWY0Lc1arPxI3cWme6XkERfWcYK3fdV_faE00BqpOq9I9KXVKLIiEzeGnAqbkhPcJNA13wBnUfhHy6uHd-0rpJ](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)+ [https://lh3.googleusercontent.com/gJduaB65SJU_87ND5niqLHHsviorJynSXpXA_YG_UgNcLJvRqmfp7-FqC0Xoc_jd-8RklRSM6xFtEUFWRi8X9UND1KSZvI9hZHa-w4Z3hnx7VyfwZpdCicUewORjiTIpSdaCWflT](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (-1, -1, 2) e [https://lh3.googleusercontent.com/PBIDp531wrrKpoqHFqTsFeiMTZKvvAeLAgy540SWIi6K8gRfHVksZ7tsfXzw0s-YEaZGXqxIeGyZf1BCLuEduZRLskU6Wdjg4ldT7Sp7xB28m_GlubmBbYElVXdPYMUfjyQOIRXd](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)– [https://lh5.googleusercontent.com/gufA7SCUV-5tkJbfHALult3G6TlpmmwESh0biqGPC8Gk4uEHeyj8r6S_MoHrkq2b1k3InQQYymuBnY_9FN4W7fSeyl4IL0LTMjCXgvjPsPqWQse87KLPieABxeKJlEj3Bmnhijtl](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (1, 3, 4).
13. Dados os vetores u= (2, 3, 1) e v = (1, -1, 2), calcule |u x v|.
14. Efetue: (i x k) x (i x j)
15. Determine o vetor unitário n, ortogonal aos vetores u = (2, 3, -1) e v = (1, 1, 2).
16. Calcule o vetor de módulo 18 e simultaneamente ortogonal a u = (2, -1, 0) e a v = (2, -4, 3).
17. Dados os vetores [https://lh6.googleusercontent.com/eQhJyrtpNIwp-cvvS9sPh4rP1cy9oErVyXpkUqzusekUCvShNsOTejyAqxddTOL2pDmB_bMDEI6Scd59e74pcMPnpaYxVL9BjleEzDLQ_zqfj_8G9f28aFhJcD8WmsHz8PIyBdk5](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)=(1,2,3) e [https://lh5.googleusercontent.com/zeP2mGRRJdVArN2c7OXKrF-t_lXw6sx8tcWx2eAhTUgpXGzVX7FMEFn0oKeLpd9LihY9Ns7ch2voU13m6toHFTrKfUvnfR4E_u17BWSaObJEUgFVYB4ODA1frYJkS-OC1UQNKoNs](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bw%7D)=(4,5,6), calcule o produto vetorial entre [https://lh6.googleusercontent.com/yoY2SOuU0qyfjU0QRZ6tUa80l3JO9lwDi8CVXnSe12_XKmPE3WwyyIx8ymTF0hczjcovtGVKkSQR99gRl1LVThis5523blLXtLM_IM7qn2C3sHCiWE3r1bijPeWpq5Ss7k0ufu_4](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)e [https://lh5.googleusercontent.com/eY8XjVIaCWCTmHimdy9A4Q9bbs9uId8ZLi7xVUmel0gK6jXryiVD3y09e_8oxgmZodXcmTFBdp5jw-RVNSncwisMbFJ8d9b3AG0YidhP3vWVdj-hbTAgwUrmNh9hXHPqDOj1BY6L](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bw%7D).
18. Determine as coordenadas do vetor [https://lh3.googleusercontent.com/qnjWK6NYrs-Vqob3Nlh6bVPQ0mytVascwgNMDxIHkWJ2G4taFjrcSbQZNmAVwev7V3hT2nKe154RBHXHQWVkkyUSfhvDhJx8IldYtAno5q8ce3X__DycwOGxryMMbJoFuQfUfMK-](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Br%7D), sabendo que ele é o produto vetorial entre os vetores [https://lh5.googleusercontent.com/0IG69X8ALmFrz5eR0pgPcg04te0IMiPMOWJi5JLHTc4u5hwSheZlR6_mn9vgjmEo1xV7SfKnS22bGJRJUZaexhDDD42LCSilaw9gn6lisQY915Trt8xtGWP1Q5r0h_D_15Zhxqrt](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bj%7D)(0, -2, 0) e [https://lh5.googleusercontent.com/kFshXVlopm9BbvvZLzxTIazgD3Bt530UyfZkSohuHj8nRB82wfnA58nf6zldm1u06sNQqilANFLNyjJzqfxG10WWHgkRS-gp1g5Hjc6s2iyho0wrS9y9ZNzFP708aXBamBxZh_ao](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bq%7D)(6, -8, 1).
19. Foi dado os seguintes vetores [https://lh5.googleusercontent.com/mSTBnUzpXHCBDOjyK-2yFO8kFlUQoLzTkDtCPa44o8e_3OcVYI_ed93YV_YAgDZ37RhbUY8__qz1z4XDEVg9UKpalkgRZkfNEsNrMo-xPu5m-1oew5FbOP17ok79_5E7IjeravDh](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= [https://lh6.googleusercontent.com/N1MC_pwp-19VbXq3n7-VS5EgovW6c0B9vC1LasQfEWHNT6N9LB-6sGFqo0Ctg4w-_EG-TCpJizmwIbRQk1pi7uXdFapb0jMITt1TGb1-tVYmyjta1EBT0RLwyezzWPVnxINoVl_y](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bi%7D)+ 2[https://lh4.googleusercontent.com/i4Q1gflAUyaK1JEE3_d_9e04uVVEOOAYFNRO0uvuzqsIXWfaCN-a9Y6sv7o74vVZh8XwsU_MxdrwR0lezqyPnP6GLnq5_dk_89bnh_rbv-vhrtv5bxBRqSzXVpsDS8pjnxleHOyx](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bj%7D) – [https://lh6.googleusercontent.com/Jzh8y8UOj876RXXpy0Sd74JEe8MP0tqUTfCSmOpcbMQsl9jwOGjxubXDm1p_uOHrdaJ1l-_DFfTypYfAUX_v_e6uaO7LPdyXKzCWPpL95sLvV8NIo53lz7u-xhMnl2vfRH61ml06](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bk%7D)e [https://lh6.googleusercontent.com/lKrgJ90QlLtSRv2JpzoK7LdSwzwqjBHxt2QmGmMVl6IWzyjxxXwPCW7uW1etj8tFdrJPgc7xdT26IcbUVRzZBw_ZYHyzQdYzH7ThF5HsDd13n3qKsrvt5-wLNpXRecXogAAan6pA](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= 3[https://lh5.googleusercontent.com/ovUiBWxYuBzb4pnJJ_ZpAgDMKYzno0FM764ENoDS76pztgjZ04o5jmWv3yyoPlTTCFzNztIp2IW0ini_d1bvDfdRSgk2kc4Cfb7ch7sQiI6quHMb7u3Y1Xsnh7D0Gn3WXNeNrjuA](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bi%7D) -[https://lh3.googleusercontent.com/G7xfIR1QjmH31vwBMs7W-eTD-JxOHpMRBQaYvnfqmjxYk1SA00CV8REA4EZ0R349xbadY6_X5Ii8G5Z9L01xvcvqdcAYbDmNCZk35OP4qG_nPYxDSBSrudemUvFtyz7OKaTTuOyf](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bj%7D) + 2[https://lh5.googleusercontent.com/pum9GUrgg2pJttNTLMW4GVDBaFm-HIfXI9EcSY8tHbVyCDl66XjoOGfBf3Nr1uSjMbarVgFZr-3I2aKd-2T1eJ_kJ3J7uyb7jOvL58xtLzbdHzxR0ElKSR2p0dxVqurb_6p0s9hW](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bk%7D), então calcule [https://lh4.googleusercontent.com/2Lw_--yvOCtm2gqdCoI7W0yx-s3GWtuApO_7z6-x2bPelWC4_w3ETjDxZvrVdWN8iGJBYF-YIVVNG49dAn0H4aE1mcYbWDOY5pD0EcvX0UXJwo0BWxoEx4pXn4sV1_r40AnUSzsU](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)x [https://lh6.googleusercontent.com/_1xSdftjr1-iwQ3s5B2UNMXTb3XhzvjVh7Y0KduDmzaQxsAgeOXv5u2Qnexmr-JdOu1Y0jdlK6CLfPcIVrLZWcMoPZtB7fETy53FYaR-xxx9X4bxw4RAIl2k0C-Au5EoaYkDRn_b](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D).
20. Calcule a área do paralelogramo determinado por [https://lh4.googleusercontent.com/IpkYr4A3g4VwBvGM2RR_ucBDCy7ot5toUwLuy64ufK0uQyOqxG7nHUcBtLkF0FQ4DK7vknN5F4J9FqvCzDSxKh3chQ84-PiUPjmQE-XrDMQel5LpyS21SYB-0304Zx16ZBA_Vdbq](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)e [https://lh3.googleusercontent.com/9u25_hRK-JGMNpDq6o3V76tOFKMFnmbakJB82-rTOR67gCRAkSmhanYlhNc3n6GTS3ZZZdMczUoT-0d5xjFJxFg1eaKzURfkHcRyO4TZYHDRpVYN888yp1VXDYyuCIW9oUKhPkRq](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D), sabendo que [https://lh5.googleusercontent.com/kDt_I2aG4SZfCqmq9DQgNh7X82VMYCsV7Sa2rWiTXN_z1tKkked_9PzIodmkQ9HI2uIfJ320DKN1S0usnfkzzG7r46eK5VRp8SRAdBGDVZXdJgiyu6V58YPNiGPaFBs5NCa_mW-l](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= (2, -3, 4) e [https://lh6.googleusercontent.com/6ucZQoil4DMdEh5IiutRY7nC5lkXMUZyVHJzWRd9ILX_Y6cn1s6WkZei5rYSEssChwmeksk3ifyF4hR7I8xqdJJ3R-__FKWHt3PlDE_zN-k8jQVhOY_0lq039iamefSuoIk6HEDW](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (1, -1, 1).

Produto Misto

1. Determine o volume do tetraedro de vértices A(2,1,3), B(2,7,4), C(3,2,3) e D(1,-2,3).
2. Um tetraedro ABCD tem volume igual a 3 u.v. Sendo A(4,3,1), B(6,4,2) e C(1,5,1), determine o vértice D que pertence ao eixo Ox.
3. Determine os valores de m de modo que o tetraedro determinado pelos vetores [https://lh6.googleusercontent.com/gE8FXyeRhayBwW3Bftyiaosn0wMmT9EeUTwGSWwh9TuDlNbtEiEONTkGuEqc7B6QFxwIAnYmJY5lqFeNBnTe2-gUZoLg3CwB8_e_wLYpQGkNYCc6iQIArc0Y7k89vbV9h2dLERMU](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Ba%7D)= (2,-3,0),  [https://lh6.googleusercontent.com/AfFtTQfvWUESfz5OxaVt0FKNQ5XyeIMmuiHOAqc0-7_0sJSGX2_55UH1g9NjbDKPjQyYROMxrhKWdNCmbqCBp2RFfsywi8BWtf-TCT1ZZqddp3NXB9sicn1HHGMVK7oovoJD6sml](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bb%7D)= (1,m,-1) e [https://lh5.googleusercontent.com/jDKpnFHhnH2Ga0q5ozlXegOlOfUkTgpr8u3D6Xwd5YOGps9h-m57f2cTYtpmTSNIBdnL-B67iE9e8m2WUMgWRUg_8BooGKUqXzh-AH-ysajqw2mHHHFZNo9ndUuT68pCmAxZWPIL](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bc%7D)= (3,0,-1) e que tenha volume igual a 2/3.
4. Calcule o volume do paralelepípedo determinado pelos vetores [https://lh5.googleusercontent.com/n0Wj18wNEA4gFVdkTI2QTsA-htJAARUjho9v7KUdRQygVyn4UwA-VoBwtWso-ucDQix6Yd2cu77V88DVUvXUdexwJMT1CodCQuHZudL5bCMrz-2p11Kb1Awos1xySNte_iOQqxN0](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= (3,5,7), [https://lh4.googleusercontent.com/tgY2ta3DOKX2Ty37tsM85H98rT8LNy08OLIRVatUFhxoMs0_orRoV40-CogKxWgT1lEihnrBCWDqaXNQMI8EW7qk8HkPUBuxlcongNnxiAPKkAePCBJ64st1u5nA449XlrQ2hoZY](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (2,0,-1) e [https://lh6.googleusercontent.com/Jm3f6G6yRnM08TO4kJ-QmAcyyiaA6FWt9_sYs1XrYmb0B07UQPMAcP_V8x04bQp8c7nBkXjZRgR4oJE2BICpGhANBVxC33aInc_QmvJf5ExJGJVJu322d3hwypvmB4NPtSU_0Byp](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bw%7D)= (0,1,3).
5. Determinar o valor de k para que os vetores [https://lh6.googleusercontent.com/WqGMkNBdTyZsCSXpjgCkYZ_TsDyCyz5ChfDhBRQVtW_dF10rjyBLKw1KaGIJeVIPt9gyHccFrN7FpaqXxS7AYcJ5ZzFAYL40KoLdA5u727tJrDkff13i7xFe3Z_LlPgoneQrEErf](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= (3,1,4) , [https://lh3.googleusercontent.com/y0KWy1M9yUpp6pFrP7qxuyuNU630-ttx2HZbhoOA8pRaLsG6KyfpiErUpG0JmH53v0Lq3lUWemM_B5zRNEjxDFNebqe7HUIEVqZcF-syrwc-dJFqWYjlPKwnAxvgiPfz7k27xg8K](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (2,k,0) e [https://lh3.googleusercontent.com/RnYx_48GxpEl4L4beDffzPOz4xxAC3vUw20oCTn8lnOrK33-l9i86YNG2egMN0Vpl9W_7L4g3davBhRwcSnUYdfc1U81OKdE-6-7hAb-vN0c0gnkbqhgzV09j-LqBkr4xB9EOrcK](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bw%7D)= (1,1,5) sejam coplanares.
6. Calcule o volume de um tetraedro ABCD cujos lados são A(1,1,0), B(6,4,1), C(2,5,0) e D(0,3,3)
7. Determine o vértice D do tetraedro,sabendo que ele pertence ao eixo Oy e que tem volume 6. Dados: A(-2,4,-1), B(-3,2,3), C(1,-2,-1).
8. Calcule m de modo que ([https://lh5.googleusercontent.com/CzTeX-DDUCjcn3iURJcOm0etgDtvdQNKW_KUAo26cj5N67BjCDuUliU0ZkBSztHGef6Q75HpwWVyzdmW_z543UquLKqiTtNxbfm6sjAlvDG9Ar6sjwPm_wwpWejXP8lkc8pc_ZwC](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D),[https://lh3.googleusercontent.com/Y5CMCcN-WwxXptXevWsf5nvuBrJxBLDSQuKD7inYRYXH8h2Y4dKfZHStBrTpo9v5uk4fjWHmzYQwQstHZ_NV7YFUvfQbJSzYL8I-D75A8YEeIu5d4B5AZzmx_ONtOGIDyQK05N_k](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D),[https://lh4.googleusercontent.com/OloXWNQa4IWm5REhOW5ICABoDMJdzbOc1suZXUvYAWsOUB8eNq4Q7kPJfPPFFbj5kGnb67xxYRpjD9XsPTFpjChLPcc7A4b3r2MEAyoAQMhfdKrhed50T82Q0wi5cvNikTGvh2Dy](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bw%7D)) = -54 onde: [https://lh4.googleusercontent.com/tBkUABzpPTwXaLs41se0yjzGN91c_YfzrORlTYPsc8lGbJKYDWYO029WOHmGoi1LRZndX1Ggq04GnTJezYS7ePb2XUQXJ1NSyq7PXv0pPlKZrB5IDQTUz_KeDuTlDZZgGKVAh9ql](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (m,2,-1), [https://lh4.googleusercontent.com/lxq5uIcgoCfEDvFEHH0kbQE9gt3-LpqevgWf3x6uTrwH9brn2cOR86yDDPsMVmNXdtlXrWbR1ntlbhb7ct-l8EosW40d7zdu_oUkE8jFEoprIbQ5HZz1lEXxcVdTFqH5PpaarXb6](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bw%7D)=(3,4,8) e [https://lh3.googleusercontent.com/pcdbY_2-WmuZcjP7IOaL-83FFefs96Ou0LqztZuWy_js42Q4jbqxbUvizaRQpZ4rpTizoJEuUu-obDf0AZQ0x0fuESEdWWtPDGNS70jS2bn7bDxbyQXQ2vI3dkBVAglU0ZJLZ1KX](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= (0,4,5).
9. Para que valor m os pontos A(1, 2, m), B(-2, -3, 2), C(5, -1, 1) e D(3, -2, -2) são coplanares.
10. Três vértices de um tetraedro de volume 6 são A(-3, 2, 3), B(-2, 4, -1) e C(-2, -1, 1). Determinar o quarto vértice D.
11. Determine y, sendo ele o produto misto entre os vetores **[https://lh5.googleusercontent.com/bJhfdrcOWuKoOLrHn__i3ezWnb90mACTI4PHzdc5hVIWp5WmdaW1FFv2rweXhkNP-51aiApW0KxSAGi9KY2DP_dRPGlONn3RYmISSq8Bztgt3IEtxTJicVcD916kjlNP4gTZudVo](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)**(7, 8, 4) , [https://lh5.googleusercontent.com/WzArKV_STsAg8TTZT8Sol71xRlAZtbtK7PQ2QDLW1a6nBLgyaahuLWT_rcF4WFJ0QA7LTB7aKbhL9ftTIrKeJA45Xan36O0nOE52wwtRVpJdNlPqIGTH7CxJB_T0WwNZUX1USZ4L](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)(-2, 1, 0) e [https://lh5.googleusercontent.com/FnpkXnhJEy761C9PGy9BiAKrHWQ729y5vq9cgKEFpvXSLOhnAHAcF5VS0oH_pYLb-t-a8Ev2-UhGOMe-JhwkI837fjUNMMjmsmm2538nT9tTNsMpPpA7V1LdLCTQ9VDM0i6fZ1Uy](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bp%7D)(4, 3,4).
12. Calcule o volume do paralelepípedo determinado pelos vetores [https://lh5.googleusercontent.com/YYERFU0qeUmzhvBDD5IkhM2oIO7n0Jz5onhN0DF7FtaEWVzn6seNh1o7BbX8Hs9A_5GgAEdwMUZA-HXvVX4mHXjy-9vMITiTmb39NiliZM5QeTLs2xWTUu6qGvGya4dup2QO3nkO](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)(-10, 4, -7) , [https://lh5.googleusercontent.com/RO7yIcdGWr47rJHWEPCVlafZgiMt38ZWxdohJAk8W-WCWm_TOEB-rdtn918Z00tc7WwXZEhSi9VFk6zKFaE3JRWsaj8foP7g3sFm1knXwOKGWbZmbthHGOpwy_UqG7mtRZL2tF_G](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)(4, -3, 5) e [https://lh3.googleusercontent.com/cTlQbDwOAqF_q5imL9oAYHkz--haPwnZiZuSFTMmG7foZqU7y2R3YpflPlScCA54FszSzNYpZOQxu_F3vy-oJAxY4J2dsJ4QMBPAqOt9dKaeylkMQP92-pbfmaj7ztaILOWu3X1-](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bp%7D)(-3, 1, -1).
13. Dado os vetores [https://lh4.googleusercontent.com/teng4i4AMn7htXCN5l1AGptlPatvRkWJKRFY4yBRPVv7ZLLCWjsqCBIyqkkJ-bOY9P6Gfl9oUKKA0OccOwDf41BcZF9_fUP-wr8aV2aiq-Je657oMLr8u0Sj_3OMK3V3e6nNoT-k](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= (0, 1, 3) , [https://lh4.googleusercontent.com/gCv7tzodJgyts8UCC6fsZJf61ImtsllrPo-nIbaLuAU2iEkwOP61IrkDQcsVzBN_5CofbtE2fPB1KeGE9uH7ryyMKEoqKvBlW4Tqmo0urht8KseoN2nZFGLlVjAH_jiFi8nJTRg0](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (2, 1, 1) e [https://lh3.googleusercontent.com/1P7hRS0EZGrwvdujArhDtAUHc3i1Crvt88ExFbz6llTiQvD1xcBbxe-pRfI5zSgRq8miVXrkifjB5PuW3TXsDJMecDVN1oWxM_ADGWHKradYoyHWgYLcCrEKFMekv56fsj2F3Pzd](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bw%7D)= (2, 2, -1). Calcule ( [https://lh5.googleusercontent.com/bWY7LeKEyRhSHIC0MGASr61zeJqhLJETG9-3a0pYr9QZarSRTRHpe65EXRNVCOlApqzYaaBO56Fhpv9ai9LkWxlWTm2MVK9HVcLWF3DG42566loODVTMgeYWy4LkeTa45ir7mHI5](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bw%7D), [https://lh4.googleusercontent.com/-FQUQYqUUhI9rb_VBzqhulk_kSkJbE2vVRiEGJ3d_3JgWHS2haa4N7_lzaOZ2tJ3VCCQJYaeGxwuIEMogl67f2nUe1MCLaKWVTT2aQQZXqOgDm7Vjq-vKTS0t540W6rRXJ39LO1K](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D), [https://lh5.googleusercontent.com/p-zXC3Wczbobls8MX41FW11W8yTDEbUPMl-iSUhn4qDIziXhl9heeMlK8DyKXA4C-RpFrfxe7XrPaVkJqXdHscjwWMceU_DXxuWEALRM1NMITvswV0ob8velBnuMGiPaRkYc2BBI](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D))
14. Para que os vetores sejam coplanares, calcule o valor de [https://lh3.googleusercontent.com/A6nfKlQXlCcDeZYzjbDWIPuMHuGydzda57qyQSLTwRKqmTMZWt4g384y4-x49lbyCL_U19PkdGVv_Xvdgx-AI8revEVPiCAHw8DerozGcScB4bhGIm5RnhgslPhWSuNW_ZmgF0Yk](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bg%7D), sabendo que [https://lh4.googleusercontent.com/3f7vDIgHLtl3gjsRnmMdvjpgtddA_V0xp6pszQkGRf0oP_UGIBSak0B_vF1qlEfUfmoWHS8KDiHxLcKNXMcmeCUsmBEivZ1WUAgXdHQ6B5rAlzmi2cKdpBnLicPKtKPy5RDGwxsX](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= (g, 2, 1),  [https://lh3.googleusercontent.com/xPz70vDIoPxfapi_0Hxhr-gl80CrWdeXPawsooo9PSTy3RTgajo4fhP3WHXQ3YR6CmsdIWxsghnufVSSr8cGJgouI70UX9_V-g-57CSTEDAud7Nv2evSE8dxYpSyyK8lqzlaLgEm](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (1, 1, 1) e [https://lh5.googleusercontent.com/P4ePbsLtO_xFLaSFwgnShrelbMHYKsMH6QJCFCNnRxP6CkuPfH8cnIbI4lgHBWSf0ctvKDMdaLThNmZRGQdF1H354PbL1NvLLlQZeVSts2M6Mu6UPEaeFz1jT7txqcGpICuDCSEu](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bw%7D)= ( 1, 2, -1).
15. Verifique se os vetores são coplanares: [https://lh6.googleusercontent.com/b7_oH2jJaR88T9UtdIoyvEWEQNcsc0NfawK1KP9vpcEQ7DkNyVsW8Hp4xXcILiMsNIPDoKbtWGa9Qu7TUSYrJGPOHxRsyyGI7yVhd9pXwJrGj0VNMAE7ky1YWXdeyFcxJde5GzTe](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= (3, 1, -1) , [https://lh6.googleusercontent.com/P3dNk7AezGCepcz_4e4VVMEM3TlNrFZiNmuTAhbRMOT_l0GklUUPHeHbU4u04buklZjHIvU88ftJ8WX_C_8NZYscFNm4_Di5Kh6XZY1oBrWK30GtGVklv31t-G47n999dtpRxAQt](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (2, 1, 2) e [https://lh4.googleusercontent.com/PDgXhsyFL0DOysNjzAApUYHnrRYQXs6E8AbGNuLWQIxbcTmXw1SUZSPVDJZiMX-o2x2tUqG4SAY2R0Vo-GUY7_xbghW-ksMibWjWRchB_yyjiOzhWhzCV-5aq6e3UUHwBmoDTJrJ](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bw%7D)= (1, 1, -1).
16. Dado os vetores [https://lh4.googleusercontent.com/cdWKykssJk2hSzSTUtkM1pSh1cx2d7V20ny5zbH9QycrMrTmas32TbsLsXdaUZu67yRAUa3e37j0aLnlygws6QN2QVwM2bOwImlfaDu8tRdihvFXKiQu72Cx_JM9XkwCAxPZoBfL](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= (-6, 8, 3) , [https://lh3.googleusercontent.com/jtpj1TzjeXy5c4nqv70hs6xbLnctYwZZf-QFQElV6GDJLu5WpQ_vPuaURKGI0QljoojMzt3bXETkbJU4ei2J4guIbaV8agrZju7IhHaHwRojECjdtaZv1PagJkTgY4vBS3Ns13nR](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (-6, 1, -2) e [https://lh5.googleusercontent.com/yZLjVUA9X4-7b58cdu9TZuSy7toMxSQ9N-PQ44AsExJdXRzuW_lXVp08ZYq9mUrgtSf3h7UdAfbL9gAgvc-w3bdCzZ9JzptYumismQxYJUGbL9yqQC7irWxyhoUXAQfp0gNHzHdi](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bp%7D)= (-6, -5, -4), calcule o volume do tetraedro.
17. Qual é o valor de x para que os vetores a = (3,–x,–2), b = (3,2,x) e c = (1,–3,1) sejam coplanares.
18. Dado um tetraedro de volume 5 e de vértices A = (2,1,–1), B = (3,0,1) e C = (2,–1,3). Calcular as coordenadas do quarto vértice D, sabendo-se que se acha sobre o eixo OY.
19. São dados os pontos A = (1, –2,3), B = (2, –1, –4), C = (0,2,0) e D = (–1,m,1), calcular o valor de m para que seja de 20 unidades o volume do paralelepípedo determinado pelos vetores **AB**, **AC** e **AD**.
20. Um paralelepípedo é determinado pelos vetores u = (6, -2, 8), v = (4, 0, 2) e w = (-4, 2, 10). Calcule o seu volume.

Reta

1. Determinar um vetor gerador e as equações paramétricas da reta r que passa pelos pontos

    A = (1, 2, −2) e B = (−1, 4, 2).

1. Determinar a reta r que passa pelo ponto A = (1,-1,0) e é paralela à reta s : P = B + t [https://lh6.googleusercontent.com/OFXtGXXUQ2acJz7ShNjEoWQhoLiwJg2538Fv0OEsazVTUs2cAecJ5ln0rwcbh-cx8iN-TEeDVpsB37sKU0as9gw5D4NoQZZtM1O6fTYXuzMUhKNYpmFb4sQMDHefIZ0JoqTexVhn](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D), onde

   B = (1,1,1) e [https://lh4.googleusercontent.com/DdLdT_XWJJtSiFhsbltgawexYrOqsIIAoSGaglLf2VBCKsdFh-qBiETtjH4w6X6rSEcyXeX3ckwbNku-w8NroIqN1tm1EKP26D7F8nJ_9VGN9YGQtkfl9in60Z4EquUNVu6f0X7P](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (0,1,1).

1. Determinar se a reta r1, paralela ao vetor [https://lh3.googleusercontent.com/iJoTpFYTjUpco3yk2mv92yzwX43L-eqMz_wbg1IMqFtZVcHO9JlepslpKFHw97z8oiQr-Z5qYiw5QZZp_UmUDLy8eo341KCgv3VHEdI-6t0cxXo0-G1WgceI3FL2jyU5gaiLI7l0](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (1,1,0) e que passa pelo ponto A = (2, -1, 0), intersecta a reta r2 que passa por B = (0,0,1) e C = (0,1,−1).
2. Seja r a reta determinada pelos pontos A(1,0,1) e B(3,-2,3). Determine a equação vetorial, paramétrica e a simétrica da reta.
3. De a equação vetorial da reta r que passa por B= (-3,-5n, ⅔) e tem a direção de v = (-2,½,-1).
4. Escrever equações paramétricas da reta r que passa por A=(3,-1,-2) e B=(1,2,4)
5. Escrever equações simétricas da reta r que passa por B =(-3,9,-3)  e tem a direção do vetor [https://lh4.googleusercontent.com/ltx-VAX2lAuCh0jHhjqB5-yxb8-mMyVXZOwzGadzJM6xPjnUGoOMoggm1KnkN-GTuhbilKEeGDsndoDkXgzq_-tKukwH6rZjSQovQqX4_SkiP6E7qBFrrmx4Lyxjxje3rZa0VsX3](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D) =(-1,8,5).
6. Calcular o angulo entre as retas r1: x= 3 + t , y = t , z = -1 -2t e r2: x +2/-2 = y-3/1 = z/1.
7. Encontre a reta que passa pelo ponto A(5, 2, 1) e B(1, 3, 2) e determine um ponto. O parâmetro da equação é 2. Encontre a equação da reta.
8. Verificar se o ponto P(-5, 5, 6) pertence a reta r: (x, y, z) = (3, -1, 2) + t(-1, 2, 2).
9. Seja o triângulo de vértices A(2, -1, 4), B(3, -3, 6), C(2, -1, 4). Escrever equações paramétricas da reta que passa pelo ponto médio do lado BC e pelo vértice A.
10. Escrever equações paramétricas da reta que passa pelo ponto A(4, -5, 3) e é paralela ao plano xOy.
11. Determine uma equação vetorial da reta r e suas paramétricas definida pelos pontos A = (-2, 4, 3) e B = (-1, 2, -1)
12. Dada a reta r: (x, y, z) = (1, 3, -2) + t(1, 4, 0), escreva as equações paramétricas de r.
13. Escreva uma equação vetorial para a reta que passa pelos pontos A = (-1, 2, -1) e B = (1, 0, 2)
14. Determine as equações reduzidas na variável z da reta que passa por A = (1, 6, -6) e B = (2, 2, -1)
15. Descubra as equações paramétricas da reta r que passa por A( 1, -1, 3) e B(4, 2, 1).
16. Uma reta passa pelo ponto A(4, 1, -4) e tem a direção do vetor [https://lh3.googleusercontent.com/L1k23TkrWsi3W_e4XVm8JmIRvowX8zU1T_fHb2uTmVKTf9deaOY17Qdkll2tjnzT4JAJ5UOG2PpWDpjogvZUVYVLGbDukNlRoaVj5olJVseEOowDgV_23wMfON9QG93K3QH6OFJR](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (3, 1, 4). Descubra o ponto B da reta.
17. Calcule o ângulo entre as retas:

               X = 3 + 2t                                     r2: x+7/-1 = y-4/1 =z+1/2

           r1:     Y  =  -4 + t                          e

                    Z = -t

1. Tendo uma reta s que passa pelo ponto A(5,-3,14), que tem a direção do vetor [https://lh3.googleusercontent.com/n13VGVctJS9zEVIgcpoMme0GOyxprx37m2YWnsZylZIhPmS-Y4QL8JbO-aoiTafYsRKxb6P152RMEPp2CYLhEKEe-s1wSwv29rcmood1tMRbf-R4LhMOZRbI2KwQ1HnFyClGKnH7](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= 2[https://lh6.googleusercontent.com/rxUJIJ6hDkn0-YtlPzOIpSBwBxhmR-Yqoy4xYYX5y8mOPIKDOqd1bH8yyV3ObaLZt0os7V2_HMlaWhVAMel_fJTizFotNhzmSaIQeIuFk3-qBQiehKqfatqwiIpSIBsLCx7yYG8x](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bj%7D)+3[https://lh3.googleusercontent.com/YtCs1r2kjCP3PDpBuSbGm58sc6ewf2Wx7P1ZUZ9vriAa1an8GSComkRABrmmrN10CKX3SweSuJM3ROy0AnbhYeIi3nuqUpZ18AwJqT6Ml-IdKmiZ85MKV4gZCGrmh9WphiuDlfrV](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bk%7D).   qual a representação da reta s?

Plano

1. O plano & passa pelo ponto A(5,2,1) e é paralelo aos vetores [https://lh4.googleusercontent.com/YkkeSgXCskiY0p2x7Qyq5ZVWCDjRec4gCQLav7jNwEIFRLEGc1KXMRVcmT2Dog-gfxIrTzeM-eR93Y5le0baPntirGaNuOpqF3sWbiJ5MfzZFnEwjajpZm3IgujsJhhFLKGE0zj-](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= (1,4,3) e [https://lh4.googleusercontent.com/I-ZyEPGZ9fr1kK1PKcHU0UJDl2v7PqOd1deBbWFJpmecNe99-615PdmZU5VRqKYhtL2CCJnAGjCr3y3WrdRBoynNKhzM1qsGEslSiOPWh_AvC2U1WYcvMcoKkZMYNAQ7XL3QWHqT](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (-1,2,3). Determine as equações vetorial e paramétrica do plano.
2. Com os dados anteriores, obtenha a equação geral do plano.
3. Verifique se o plano p1: 4x + 12y - 3z - 10 = 0 e o plano p2: 6x - 5y - z + 2 = 0 são perpendiculares.
4. Verifique se a reta r: (x,y,z) = (4,2,1) + t (1,3,1) é paralelo ao plano p1: 3x + 2y - z + 2 = 0.
5. Obter uma equação geral o plano que passa pelo ponto A =(2,-1,3) e tem   [https://lh6.googleusercontent.com/hg8ZnYkKBNvAYN_wQwopwbAu03wORzY5y4pNW7r8wkXLKPfRqvJwuA4Ex10ncIRx3agw7d28Y7inGcHGyrOpz5QR6GWj70-J0AxtYtGaa3Yh20NSB1PWHupH_6mhA22z4Y5ZCqVm](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bn%7D) = (3,2,-4) como um vetor normal.
6. Obter uma equação geral o plano que passa pelo ponto A =(4,-2,1)  e é paralelo ao plano 2: 2x - 3y -z +5 = 0.
7. Obter uma equação geral o plano que passa pelo ponto B = (1,2,3) e é paralelo aos vetores [https://lh6.googleusercontent.com/C9iTLTTVkyakMGyMqahgh4MM0OAyJjRlzoP2vB2DTOe_Ldvie2o4_9ZHmChf5VxBXdf5RcJT4Pou_V98XKPkOhMj7c-uaYrN7a1pjozVKHnVEPNuTtCrOt7itw8MwidXUfhTnlxO](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= 3[https://lh6.googleusercontent.com/RzXrdP3UzXTfnpN-0BMEEgVwwJknpoC2Evs1unasvm6RAeJcjU5Kmx2cBoF1DbpWyy6HHwNSWuLFp9Tbbh-wQo2xM_vmMv3yW42xqXw8YOW9dkJF7KTsggiArBUqinrxGt4mxWG5](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bi%7D) +[https://lh5.googleusercontent.com/gns26-sTnVUfniT7AX2mPXqmqImj5cIH7lhBPxEhux705H95ROlMRTeTZvsm0LrvVE47b5WKHnZ0fOMLaFdOeaZDKqJXri-BlVxWXlkMnmEbYUyEKueBK7tQhkFmdcQ4TFswJ6bx](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bj%7D) + 2[https://lh6.googleusercontent.com/nkDTfTaRxs4XVkaUqaLenfqIMdri5Fb6MehIJrOT5bXqDuMBXE1im8GLChIRbkZZH4wQBzFumbsFUceCPu4MqhvSZHGpxedReAiSs5ztdR9AIrYEqvpxt8qsjYeE80eEBqEuXcPy](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bk%7D) e [https://lh6.googleusercontent.com/oLOOJdpgoADVyrx14GEaxqjqqln1N32PdEcc7GmS5lBYksKp0h6y3PEK3adNQed-vLwPU2SYypB8UXzZ3aLB4lmA3WpIrYUB45qDPZWfHHP3pDrWQrLcCkrhIUKbwprr823I0DzX](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= [https://lh3.googleusercontent.com/jLtUFa3rjzAMN3IzugEet7L2cem1Wh6U6Dsa-pXGHuKpKR3PYXo4W-pDZxeGgfgdE4cwpzQvMocdDidbbEv1_ub4-ty7BrpBd204zNMXWKy-1ennzJUJeFnoHppUWJ0RnH5sZlB3](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bi%7D)+n [https://lh6.googleusercontent.com/4k2a84EyeZCqFQPx2wGWgAQooRFxP8oMez2FjPzbr5Fz8nz4hN71qumWtwnoQxy_liHj47xMQdJZfL3SC4yRHF36jdmY9yD6egTG2Ti6iUsF00BZ1akFyakPkaN6tRZT_H7wByP_](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bj%7D)+ 6[https://lh4.googleusercontent.com/tPQdzRGrhbLRTtj28Dk6qkEAfzZ4uEj7ANAZokz6NAWgund8WB_IJky_iXUnF7ThMklgjuWQdwIjdg7ECgdnOG1HD-8yPRtUeEkf7NBx5xxiPe8LNLHsaQvxALcEiA7dqnWCg_Ze](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bk%7D).
8. Seja o plano que passa pelo ponto A = (2,2,-1) e é paralelo aos vetores [https://lh3.googleusercontent.com/21OjczOrcvMcoupTCUjQnXmfhGijgQDF__clFqBZjj-vhl6ee73sAQjYFq3T05ZThRAT5CeBFcYxqcEnFSxlLP3c9a9SnyvAcdsJz0Bv5oKjeNA8gqE_tgb4uUAOW_DIT3DqlpkY](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= (2,-3,1) e  [https://lh4.googleusercontent.com/7wXCobodfORrNoqX9zbDb_jgUKjmSj2MPBNQPP6uermrgaBscWhTVQXaV9_1hFgPTvtGy_rwqT88N-kD-MdNumLo3rQIvF2UvxgSmdDpP64BM4bLl6PhXkdNe3vOLz-TAKoPmQoy](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D) = (-1,5,-3) . Obter uma equação vetorial,um sistema de equações paramétricas e uma equação geral de π.
9. Determinar o ponto de intersecção da reta   r: x = 0 + t com plano π : 3x + 5y − 2z −9 = 0 .

y = 3 + 2t

z = -4 + 3t

1. Determinar o ângulo entre os planos cujas equações são:

                            π1: x + y + z = 0

                            π2: x – y – z = 0

1. Escrever uma equação geral do plano que passa por A(-1, 2, -1) e é paralelo a cada uma das retas r1: y = x, z= 1 – 3x e r2: 2x = y = 3z.
2. Dado dois planos p1 : 2x - 3y + 2z - 7 = 0 e p2: - 2x  - 2y - z + 5  = 0, verifique se os planos são perpendiculares.
3. Escrever uma equação do plano que contém o ponto A = (1,1,1) e é perpendicular ao vetor v = (2,-1,8).
4. Encontre as equações vetorial e paramétricas do plano π determinado pelos pontos A = (1, 0, 1), B =  (−1, 2, 3) e C = (3, 1, 0).
5. Encontre equações paramétricas para o plano cuja equação geral é 2x + 3y + z = 1.
6. Encontre a equação geral do plano com equação vetorial P = (0, 1, 2) + (3, 1, 2)t + (1, 2, 1)s.
7. Mostre a equação vetorial e a equação paramétrica de um plano π que passa no ponto T(4, -2, 3) e é paralelo ao aos vetores [https://lh3.googleusercontent.com/KtAMCZnqUCwD90nW6G5Q9TQSrG6P4dhmF5XQrNx4-FOKZP93pXEZahrgt7lnyYPqFnLGX273Po1E2AQGDWOHBvuouixOA31kP7yNRRDc47-zdWhFUI_IfdTfNShZ0qDqloYUsTWw](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bu%7D)= (1, 4, -3) e [https://lh6.googleusercontent.com/GMIhePTnxQ2a5EFlSZZKS4XuDwAsGPSazFkQyf5IUfJa_C35w08yZjfatFyyP-Uvmw86L5p9JPPgl2xnV3snhlx0ofrZKhaPe9TPNSVLnKGEomNUyIzGBaqrMDtFUv2-GuVvFIZU](http://chart.googleapis.com/chart?cht=tx&chl=%5Cvec%7Bv%7D)= (-2, -1, 1).
8. Calcule o ângulo entre os planos π1 : −y+1 = 0 e π2 : y+z+2 = 0.
9. Determine o ponto de interseção da reta r com o plano π: 3x - y+ 2z- 1 = 0    e         r :    x = -2 + 3t

y = 5 + t

z = 2 -2 t

1. Considere o plano π de equação geral 3x + 2y − z + 7 = 0 e uma reta

     r:     x = 2t ,

            y = −1 + t

            z = 2 + 5t prove que o plano π e a reta r são concorrentes.