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1  # NOTE:
2  # Always import as:
3  # from rotations import *
4
5  def make_Rbf(angles):
6      from math import cos, sin, pi
7      [psi, theta, phi] = angles
8
9      psi = psi * (pi/180)
10     theta = theta * (pi/180)
11     phi = phi * (pi/180)
12
13     R_bf = [[cos(psi)*cos(theta), sin(psi)*cos(theta), -sin(theta)],
14             [cos(psi)*sin(theta)*sin(phi)-sin(psi)*cos(phi),
15             • cos(psi)*cos(phi)+sin(theta)*sin(psi)*sin(phi),
16             • cos(theta)*sin(phi)],
17             [cos(psi)*sin(theta)*sin(phi)+sin(phi)*sin(psi),
18             • sin(theta)*sin(psi)*cos(phi)-sin(phi)*cos(psi),
19             • cos(theta)*cos(phi)]]
20
21     return R_bf
22
23 def make_Rbw():
24     from math import cos, sin, pi
25     [alpha, beta] = angles
26
27     # ***WARNING!***
28     #If alpha or beta> 1 radian (60 deg), this breaks
29     if alpha > 1 or beta > 1:
30         alpha = alpha * (pi/180)
31         beta = beta * (pi/180)
32
33     R_bw = [[cos(alpha)*cos(beta), 0, 0],
34             [sin(beta), 0, 0],
35             [sin(alpha)*cos(beta), 0, 0]]
36
37     return R_bw
38
39 def b2f(angles, vector):
40     from numpy import matmul, transpose
41     R_fb = transpose(make_Rbf(angles))
42     return matmul(R_fb, vector)
43
44 def f2b(angles, vector):
45     from numpy import matmul

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```
41         from numpy import matmul
42         R_bf = make_Rbf(angles)
43         return matmul(R_bf, vector)
44
45     def b2w(angles, vector):
46         from numpy import matmul
47         R_wb = transpose(make_Rbw(angles))
48         return matmul(R_wb, vector)
49
50     def w2b(angles, vector):
51         from numpy import matmul, transpose
52         R_bw = make_Rbw(angles)
53         return matmul(R_bw, vector)
54
```