

# PreReg2

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[29]: *# Problem 1 : Vectors and Complex Numbers*

```
import numpy as np

a = np.array([2.0, -1.0])
b = np.array([1.0, 3.0])

za = a[0] + 1j*a[1]
zb = b[0] + 1j*b[1]
innerIm = np.conj(za) * zb
realInnerIm = np.real(innerIm)
dot = np.dot(a,b)

print("Re(z_a z_b):", realInnerIm)
print("a\b:", dot)

print("Is a\b = Re(z_a z_b):", realInnerIm==dot)
```

Re(z\_a z\_b): -1.0

a b: -1.0

Is a b = Re(z\_a z\_b): True

[31]: *# Problem 2 : Express z\_x in the Complex Basis*

```
import numpy as np

x = np.array([3.0, 4.0])
zx = x[0] + 1j*x[1]

B = np.array([[1.0, 1.0], [1.0, -1.0]])

alpha_beta = np.linalg.solve(B,x)
alpha = alpha_beta[0]
beta = alpha_beta[1]

print("Real Coefficients")
```

```
print("alpha:", alpha)
print("beta:", beta)

# Optional: Verify
b1 = 1 + 1j
b2 = 1 - 1j
zx_reconstructed = alpha * b1 + beta * b2
print("Reconstructed z_x:", zx_reconstructed)
```

Real Coefficients

alpha: 3.5

beta: -0.5

Reconstructed z\_x: (3+4j)