Problem 1. 1/4

Problem 2.

\[ F = \begin{pmatrix} 0 & 0 \\ \sqrt{3}/2 & 0 \end{pmatrix} \]

Problem 3. No

Problem 4. a) \([3/\sqrt{10}, 0, -1/\sqrt{10}], [2/7, 3/7, 6/7]\)
b) \([601/490, 24/49, 333/490]\)

Problem 5. a) \(\lambda^2 + 2\lambda + 1\)
b) Not possible (the eigenvalue \(\lambda = -1\) has the algebraic multiplicity 2, and the geometric multiplicity 1.)

Problem 6.
a) \([1, 2, 0], [0, 1, 1]\). (column vectors are listed horizontally here)
b) \([1, 0, 2, 3], [0, 1, 0, -1]\).
c) \([-3, 1, 0, 1], [-2, 0, 1, 0]\) (column vectors are listed horizontally here)
d) \(rk(A) = nullity(A) = 2\).

Note: the correct answers for the parts a), b), c) are not unique.