**Math 1553 Worksheet 9**

November 4, 2016

**1.** In what follows, $T$ is a linear transformation with matrix $A$. Find the eigenvectors and eigenvalues of $A$ without doing any matrix calculations. (Draw a picture!)

**a)** $T =$ identity transformation of $\mathbf{R}^3$.

**b)** $T =$ projection onto the $xz$-plane in $\mathbf{R}^3$.

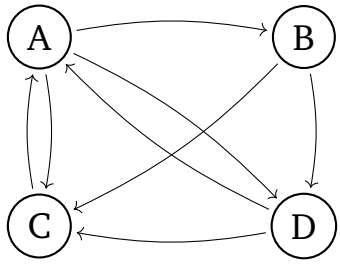
**c)** $T =$ counterclockwise rotation by $\pi/4$ in $\mathbf{R}^2$.

**d)** $T =$ reflection over $y = 2x$ in $\mathbf{R}^2$.

**2.** For each of the following matrices $A$, decide if $A$ is diagonalizable. If it is, find an invertible matrix $P$ and a diagonal matrix $D$ such that $A = PDP^{-1}$. (Use a calculator to compute the characteristic polynomial and to do row reduction.) Hint: 3 is an eigenvalue of both matrices.

**a)** $A = \begin{pmatrix} 8 & 36 & 62 \\ -6 & -34 & -62 \\ 3 & 18 & 33 \end{pmatrix}$ **b)** $A = \begin{pmatrix} 12 & 68 & 118 \\ -17 & -122 & -216 \\ 9 & 66 & 117 \end{pmatrix}$

**3.** Consider the following Internet from class:




**a)** Find the Google Matrix $M$ with damping factor $p = .15$.

**b)** [Half the class:] Compute the steady state vector of $M$ by row reduction. (Use a calculator.)

**b')** [Half the class:] Compute the steady state vector of $M$ by starting with a vector $v_0$ whose entries sum to 1, then iteratively multiplying by $M$. (Use a calculator.)

**c)** Which is the highest-ranked page?