Question 1 *True/False: $n \times n$ matrices A and B are said to be similar if $A = PBP^{-1}$ for some invertible matrix P.*

Multiple Choice:

(a) *True* ✓

(b) *False*

Question 2 *Let* $D = \begin{bmatrix} 2 & 0 \\ 0 & 5 \end{bmatrix}$ *and let* $k \geq 1$. *What is* D^k*?*

Multiple Choice:

(a) $D^k = \begin{bmatrix} 2^k & 0 \\ 0 & 5^k \end{bmatrix}$ ✓

(b) $D^k = \begin{bmatrix} 2k & 0 \\ 0 & 5k \end{bmatrix}$

(c) $D^k = \begin{bmatrix} 2 & k \\ k & 5 \end{bmatrix}$

(d) $D^k = \begin{bmatrix} 2^k & k \\ k & 5^k \end{bmatrix}$

Question 3 *Let* $D = \begin{bmatrix} 2 & 0 \\ 0 & 5 \end{bmatrix}$ *and let* $k \geq 1$. *What is* D^k*?*

Multiple Choice:

(a) $D^k = \begin{bmatrix} 2^k & 0 \\ 0 & 5^k \end{bmatrix}$ ✓

(b) $D^k = \begin{bmatrix} 2k & 0 \\ 0 & 5k \end{bmatrix}$

(c) $D^k = \begin{bmatrix} 2 & k \\ k & 5 \end{bmatrix}$

(d) $D^k = \begin{bmatrix} 2^k & k \\ k & 5^k \end{bmatrix}$

Question 4 *Let* $A = PDP^{-1}$ *such that* $P = \begin{bmatrix} 3 & -1 \\ -8 & 3 \end{bmatrix}$ *and* $D = \begin{bmatrix} 2 & 0 \\ 0 & -2 \end{bmatrix}$. *Compute the following:*

$$A^4 = \begin{bmatrix} \boxed{16} & \boxed{0} \\ \boxed{0} & \boxed{16} \end{bmatrix}$$

$$A^3 = \begin{bmatrix} \boxed{136} & \boxed{72} \\ \boxed{-384} & \boxed{-136} \end{bmatrix}$$

Question 5 *True/False: An* $n \times n$ *matrix* A *is diagonalizable if and only if* A *has exactly* n *eigenvectors.*

Multiple Choice:

(a) *True*

(b) *False* ✓

Hint: *Read the Diagonalization Theorem.*

Question 6 *True/False: If a* 4×4 *matrix* A *has a linearly independent set of four eigenvectors, then* A *is diagonalizable.*

Multiple Choice:

(a) *True* ✓

(b) *False*

Hint: *Read the Diagonalization Theorem.*

Question 7 *True/False: It is possible for an* $n \times n$ *matrix* A *to have a linearly independent set of more than* n *eigenvectors.*

Multiple Choice:

(a) *True*

(b) *False* ✓

Hint: *A has n eigenvalues (counting multiplicities). For each eigenvalue, the eigenspace has dimension less than or equal to the multiplicity of the eigenvalue.*