Birzeit University

Mathematics Department

Chapter 3 Math 234 2017*/*2018

Name.................................... Number.................. Section .......................

**(Q1)** Fill the blanks with true (T) or false (F).

[ T] (1) If *A* is an *n* × *n* singular matrix, then *rank*(*A*) ≤ *n* − 1.

[ F] (2) Any set of vectors containing the zero vector is linearly independent.

//[F ] (3) Every nonzero subspace of *P*3 contains an infinite number of polynomials.

[ T] (4) If *A* is a 5 × 3 matrix, then the row space of *A* can equal R1×3.

[T ] (5) Any subset of linearly dependent vectors is linearly dependent.

[T ] (6) *Span*(*u,v*) = *Span*(*u*) iff *v* is a scalar multiple of *u*.

[ F] (7) If *A* is a square matrix with linearly independent rows, then *A* is nonsingular.

[F] (8) The rank of a matrix is the number of the nonzero rows of *A*.

[F] (9) If the set {*v*1*,...,vk*} spans *P*4, then *k* = 4.

[F] (10) If the set {*v*1*,...,vk*} is linearly independent in *P*4, then *k* = 4.

[T] (11) If *A* is a nonsingular matrix, then *rank*(*A*) = *rank*(*A*−1).

[F] (12) If *S* is a subspace of a vector space *V* and *S* is finite-dimensional, then *V* is finite-dimensional.

[T] (13) If *S* is a subspace of R3 containing the vectors *e*1*,e*2*,e*3, then *S* = R3.

[F] (14) There exists a 5 × 4 matrix *A* with *CS*(*A*) = R5.

[T] (15) If *A* is an *m* × *n* matrix and *b* ∈ R*m*, then *CS*(*A*) is the solution set of the system *Ax* = *b*.

[T ] (16) A minimal spanning set of R*m*×*n* is a basis of R*m*×*n*.

[ T] (17) The vector space *C*[−1*,*1] has no spanning set.

//[T ] (18) If *A* is an 5 × 7 matrix, then *rank*(*A*) = *rank*(*AT*).

//[T ] (19) If *A* is an 5 × 7 matrix, then *nullity*(*A*) = *nullity*(*AT*).

[ F] (20) If *A* and *B* are 6 × 6 singular matrices, then *rank*(*A*) = *rank*(*B*).

//[ T] (21) If *A* and *B* are 5 × 5 matrices with *rank*(*AB*) = 4, then *rank*(*BA*) *<* 5.

[F ] (22) If *A* and *B* are 3 × 3 matrices with *rank*(*A*) = *rank*(*B*) = 2, then *rank*(*AB*) = 2.

[ T] (23) If *f,g* are vectors in *Pn*, then 2*g* ∈ *span*(*f,g*).

[ F] (24) If *u,v,w* are nonzero vectors in R2, then *w* ∈ *span*(*u,v*).

//[ T] (25) If *A* is an *m* × *n* matrix with *N*(*A*) 6= {0}, then the system *Ax* = *b* cannot have a unique solution.

[F ] (26) The column space of a matrix *A* is the set of the solutions of *Ax* = 0.

[ T] (27) The set of all solutions of an *m* × *n* homogeneous linear system is a subspace of R*m*.

//what?! 9\*1[F] (28) If *A* is a 9 × 3 matrix with *nullity*(*A*) = 0,then *Ax* = (1*,*2*,*3)*T* has infinite number of solutions.

[ F] (29) If *A* is an *m* × *n* matrix, then *rank*(*A*) ≤ *n*.

[ T] (30) The set {1*,*sin2 *x,*cos2 *x*} is linearly dependent in *C*[0*,π*].

[ T] (31) If *S,T* are subspaces of *P*5, then 0 ∈ *S* ∩ *T*.

[ T] (32) If *S* is a subspace of a finite-dimensional vector space *V* with *dim*(*S*) = *dim*(*V* ), then *S* = *V* .

[ T] (33) Any basis of R2×4 must contain exactly eight vectors.

[ T] (34) The solutions of the equation *x*1 + *x*2 − *x*3 + 2*x*4 = 0 form a subspace of R4.

//[T ] (35) If *A* is a 4 × 4 matrix with *a*2 = −*a*4, then *N*(*A*) =6 {0} .

[T ] (36) If the vectors *v*1*,v*2*,v*3*,v*4 span R2×2, then they are linearly independent.

[F ] (37) *rank*(*A*) = number of columns of *A* − number of rows of *A*.

[F ] (38) If *V* is a vector space with dimension *n >* 0, then any set of *n* or more vectors is linearly dependent.

[ F] (39) If three vectors span a vector space *V* , then any collection of six vectors in *V* spans *V* .

[T ] (40) If the vectors *v*1*,...,vn* span a vector space *V* and *v*1 is a linear combination of *v*2*,...,vn*, then *V* = *span*(*v*2*,...,vn*).

[T ] (41) The set *B* = {*v*1*,...,vn*} is a spanning set for a vector space *V* if every vector in *V* is a linear combination of the vectors of *B*.

[F ] (42) The set *B* = {*v*1*,...,vn*} is a basis of a vector space *V* if every vector in *V* is a linear combination of the vectors of *B*.

[ T] (43) If *S* is a subset of a vector space *V* that does not contain 0, then *S* is not a subspace of *V* .

[ T] (44) Every set of vectors spanning R3 has at least three vectors.

[ F] (45) If *A* is an *n* × *n* symmetric matrix, then *rank*(*A*) = *n*.

[T ] (46) If *A* is a 4 × 7 matrix with *rank*(*A*) = 4, then the system *Ax* = 0 has a nontrivial solution.

//[ T] (47) If *rank*(*A*) = *rank*(*A*|*b*), then the system *Ax* = *b* is consistent.

[ F] (48) If *U* = {(*x,y*)*T*;*y* = *x* + 1}, then *U* is a subspace of R2.

[F ] (49) If *A* is a 3 × 7 matrix, then it is possible that the dimension of *CS*(*A*) is 6.

[T ] (50) If *A* is a nonzero matrix of the form , then *rank*(*A*) = 2.

[T ] (51) If *S* is a subspace of R4 with *dim*(*S*) = 2, then *S* can have a spanning set of three vectors.

[ T] (52) The columns of a nonsingular 10 × 10 matrix form a basis for R10.

[T ] (53) The set {(*x*1*,x*2*,x*3*,x*4)*T* | *x*1 + *x*3 = *x*2 − *x*4 = 0} is a subspace of R4.

[F ] (54) If *E* is an elementary matrix, then it has linearly independent columns.

[ T] (55) If *v*1*,v*2 are nonzero vectors in R5 with *v*1 + *v*2 = 2*v*1 − *v*2, then *v*1*,v*2 are linearly dependent.

[ T] (56) The set of all 8 × 8 elementary matrices forms a subspace of R8×8.

//[ F] (57) The set *B* = {1*,x*2 − *x*} is a basis for the subspace *S* = { *f* ∈ *P*3 | *f* is even }.

[F ] (58) The interval [0*,*∞) is a subspace of R.

[T ] (59) If *v*1*,v*2*,v*3 are linearly independent in R3, then *span*(*v*1*,v*2*,v*3) = R3.

[ T] (60) The functions *f*(*x*) = 3*x* and *g*(*x*) = | − 3*x*| are linearly independent in *C*[−4*,*4].

[F ] (61) The functions *f*(*x*) = 3*x* and *g*(*x*) = | − 3*x*| are linearly independent in *C*[−4*,*0].

[ F] (62) *dim*( *span*(2*,*cos(2*x*)*,*sin(2*x*)) ) = 2.

[ T] (63) *dim*( *span*(2*,*cos2 *x,*sin2 *x*) ) = 2.

//[ F] (64) *S* = {*f*(*x*) ∈ *P*5 | *f*(−2) = 0 or *f*(2) = 0} is a subspace of *P*5.

[ T] (65) *S* = {*f*(*x*) ∈ *P*5 | *f*(−2) = 0 and *f*(2) = 0} is a subspace of *P*5.

[ F] (66) If *nullity*(*A*) = 0 and *Ax* = *b* has a solution, then *Ax* = *b* has infinitely many solutions.

[T ] (67) If the system *Ax* = *b* has infinite number of solutions, then *N*(*A*) 6= {0}.

[ T] (68) If *b* ∈ *CS*(*A*), then the system *Ax* = *b* is consistent.

[T ] (69) Two row equivalent matrices have the same nullity.

[ T] (70) Two row equivalent matrices have the same rank.

[ T] (71) Two row equivalent matrices have the same null space.

[ F] (72) Two row equivalent matrices have the same column space.

[T ] (73) Two row equivalent matrices have the same row space.

[ F] (74) The coordinate vector of 12 + 6*x* with respect to the basis {*x,*4} is (3*,*6)*T*.

[F ] (75) If three vectors span a vector space *V* , then *dim*(*V* ) = 3.

// [ T] (76) If *u,v* ∈ *V* and *B* is a basis of *V* , then [*αu* + *βv*]*B* = *α*[*u*]*B* + *β*[*v*]*B* for any scalars *α,β* .

[T ] (77) The transition matrix of two bases is always nonsingular.

[ T] (78) If *S* is a subspace of a vector space *V* , then 0 ∈ *S*.

[T ] (79) If *dim*(*V* ) = *n >* 0, then any set of *m > n* vectors in *V* is linearly dependent.

[T ] (80) If *dim*(*V* ) = *n >* 0, then any set of *m < n* vectors in *V* doesn’t span *V* .

[T ] (81) *rank*(*A*) = number of columns of *A* − *nullity*(*A*) .

[T ] (82) If six vectors span *V* , then a collection of seven vectors in *V* is linearly dependent.

[ T] (83) If two vectors are linearly dependent, then each of them is a scalar multiple of the other.

[T ] (84) If the system *Ax* = *b* is inconsistent, then *b* 6∈ *CS*(*A*).

[ T] (85) The vectors (4 are linearly dependent.

[F ] (86) Any subset of *V* that contains the zero vector is a subspace of *V* .

[T ] (87) If *dim*(*V* ) = 4 and *v*1*,v*2*,v*3*,v*4 are distinct vectors in *V* , then *span*(*v*1*,v*2*,v*3*,v*4) = *V* .  
 [F ] (88) The vector space *R* has infinitely many subspaces.

[ F] (89) If the columns of *A* are linearly independent, then *Ax* = *b* is always consistent.

/[T ] (90) The set of all *n* × *n* nonsingular matrices is a subspace of R*n*×*n*.

[ F] (91) If {*v*1*,...,vn*} is a spanning set of *V* , then *dim*(*V* ) ≥ *n*.

[ F] (92) The dimension of *Cn*[*a,b*] is *n*.

[ T] (93) All solutions of the *m* × *n* system *Ax* = *b* is a subspace of R*n*.

/[T ] (94) If *x*1*,x*2 are two distinct solutions of *Ax* = *b*, then *x*1 and *x*2 are linearly independent.

[ T] (95) The set is a spanning set of R2.

//مش شرط بس الزيرو صح ؟[ ] (96) If *S*1*,S*2 are two subspaces of R2, then *S*1 ∩ *S*2 = {0}.

[ F] (97) If *A* is a 4 × 3 matrix with *rank*(*A*) = 3, then *Ax* = 0 has a nontrivial solution.

[T ] (98) If *U,W* are subspace of *V* , then *U* ∩ *W* is a subspace of *V* .

[F ] (99) If *U,W* are subspace of *V* , then *U* ∪ *W* is a subspace of *V* .

[ ] (100) If *U,W* are subspace of *V* , then *U* + *W* is a subspace of *V* .

[F ] (101) If *A* is a 5 × 4 matrix and *Ax* = 0 has only the trivial solution, then *rank*(*A*) = 4.

[F ] (102) If {*v*1*,...,v*2} is a spanning set of *V* and *vn*+1 ∈ *V* , then the set {*v*1*,...,vn,vn*+1} doesn’t span *V* .

[T ] (103) The vectors (1 form a basis for R3.

[T ] (104) If *A* is a 5 × 7 matrix, then *nullity*(*A*) ≥ 2.

[T ] (105) If *A* is a 4 × 4 matrix with *rank*(*A*) = 4, then *A* is row equivalent to *I*.

[ T] (106) If *A* is a 4 × 4 matrix with *rank*(*A*) = 3, then *AT* is singular.

[ T] (107) If *A* is a 4 × 4 matrix with *rank*(*A*) = 0, then *adjA* = 0 .

[T ] (108) It is possible to find a matrix *A* of size 3 × 5 such that *nullity*(*A*) = 1.

[T ] (109) If *f*1*,...,fn* ∈ *Cn*−1[*a,b*] and *W*[*f*1*,...,fn*](*x*) = 06 ∀*x* ∈ [*a,b*], then *f*1*,...,fn* are linearly independent in *C*[*a,b*] .

[ T] (110) The set {*x* − 1*,x*2 + 2*x* + 1*,x*2 + *x* − 2} forms a basis of *P*3.

[ T] (111) If *A* is an *n* × *n* matrix and *RS*(*A*) = R1×*n*, then *CS*(*A*) = R*n*.

[ F] (112) If *f,g,h* ∈ *C*2[*a,b*] and *W*[*f,g,h*](*x*) = 0 ∀*x* ∈ [*a,b*], then *f,g,h* are linearly dependent in *C*[*a,b*] .

[ T] (113) The vectors *x,ex,xex* are linearly independent in *C*[0*,*1].

[T ] (114) If *v*1*,v*2 are linearly independent in R3, then ∃ *v*3 ∈ R3 such that *span*(*v*1*,v*2*,v*3) = R3.

[F ] (115) If the vectors *v*1*,...,vn* are linearly independent in *V* , then *V* is finite-dimensional.

[T ] (116) If *dim*(*V* ) = *n >* 0, then any *n* + 1 vectors in *V* are linearly dependent.

[ F] (117) Every linearly independent set of vectors in *Pn* must contain *n* polynomials.

[F ] (118) If *V* is an infinite-dimensional vector space, then any subspace of *V* is infinite-dimensional.

[ T] (119) If *dim*(*V* ) = *n* and *S* is a nonzero subspace of *V* , then 0 *< dim*(*S*) ≤ *n*.

[ T] (120) If *A* is an *m* × *n* matrix such that the system *Ax* = *b* is consistent for every *b* ∈ R*m*, then the reduced row echelon form of *A* has *m* nonzero rows.

[ F] (121) The set of all polynomials of degree 3 under the usual addition and scalar multiplication is a vector space.

[ T] (122) Any set of vectors which contains the zero vector is linearly dependent.

/[T ] (123) If the set {*v*1*,v*2*,v*3} is linearly independent, then {*v*1*,v*1 +*v*2*,v*1 +*v*2 +*v*3} is linearly independent.

[T ] (124) Any subspace of a vector space is also a vector space.

[ ] (125) The dimension of the subspace {*A* ∈ R2×2 | *A* is symmetric} is 2.

[ ] (126) If *A* is an *m* × *n* matrix and *B* a nonsingular *m* × *m* matrix, then *N*(*BA*) = *N*(*A*).

[T ] (127) If *A* is a 4 × 3 matrix and *Ax* = 0 has only the zero solution, then *dim*( *RS*(*A*) ) = 3.

[ T] (128) If *A* is a 3 × 3 matrix, then *A* is nonsingular iff *N*(*A*) = {0}.

[F ] (129) If *A* is a 3 × 5 matrix, then *A* can have four linearly independent columns.

[ F] (130) If *V* is a vector space such that *span*(*v*1*,v*2*,v*3) = *V* , then *dim*(*V* ) = 3.

//[ F] (131) If *U,W* are subspaces of a finite-dimensional vector space with *U* 6= *W*, then *dim*(*U*) 6= *dim*(*W*).  
 [ T] (132) If *A* is an *n* × *n* matrix and *Ax* = *b* has more than one solution for some *b* ∈ R*n*, then *rank*(*A*) 6= *n*.

[T ] (133) The dimension of the subspace {*A* ∈ R2×2 | *A* is diagonal} is 2.

/[T ] (134) If *A* is an *m* × *n* matrix and *Ax* = *b* is consistent ∀ *b* ∈ R*m*, then *n* ≥ *m*.

[F ] (135) If the set {*v*1*,v*2*,v*3} is a basis of *V* , then any four vectors span *V* .

[ T] (136) If *A* is an *n* × *n* matrix and *Ax* = *b* is consistent ∀ *b* ∈ R*n*, then *A* is nonsingular.

ا[ ] (137) If *S* is a set of linearly independent vectors, then any nonempty subset of *S* is linearly independent.

[ F] (138) If *S* is set of linearly independent vectors in a vector space *V* , then any subset of *V* containing *S* is linearly independent.

// [T ] (139) If *B* is a basis for a vector space *V* , then *B* spans any subspace of *V* .

[T ] (140) *span*(*x* + 1*,x* − 1) is a subspace of *P*2.

[ T] (141) If *U* = *RREF*(*A*), then *U* and *A* have the same null space.

[ T] (142) If *v*1*,v*2*,v*3 ∈ *V* and *span*(*v*1*,v*2*,v*3) = *span*(*v*1*,v*3), then *v*1*,v*2*,v*3 are linearly dependent.

[T ] (143) If the columns of a square matrix *A* are linearly independent, then *det*(*A*) 6= 0.

[ F] (144) If *A* is a singular matrix, then *nullity*(*A*) = 0.

[ F] (145) If *dim*(*V* ) = 4 and {*v*1*,v*2*,v*3*,v*4} ⊆ *V* , then *V* = *span*(*v*1*,v*2*,v*3*,v*4).

[ T] (146) In any vector space, *α*0 = 0.

[T?! ] (147) If *u* ∈ *V* and *α* a nonzero scalar with *αu* = 0, then *u* = 0.

[T ] (148) Every spanning set of R2×3 contains at least six vectors.

[T ] (149) The set {*p*(*x*) ∈ *P*5 | *p*(*x*) is even} is a subspace of *P*5.

[ ] (150) The vector (3

[ T] (151) If *A* is a nonzero 3 × 2 matrix and *Ax* = 0 has a nonzero solution, then *rank*(*A*) = 1.

[ F] (152) In R3, every set with more than three vectors can be reduced to a basis of R3.

/ [T ] (153) If *A* is a nonsingular matrix, then *RS*(*A*) = *RS*(*AT*).

[F ] (154) R2 is a subspace of R4.

[T ] (155) *P*2 is a subspace of *P*4.

// [ ] (156) It is possible to find a pair of two-dimensional subspaces *S* and *T* of R3 such that *S* ∩ *T* = {0}.

//[T ] (157) If *A* and *B* are *n* × *n* nonsingular matrices, then *rank*(*AB*) = *rank*(*BA*).

[ T] (158) If ˆ*x* is a solution of the system *Ax* = *b* and ˆ*y* ∈ *N*(*A*), then ˆ*x* − 5*y*ˆ is a solution of *Ax* = *b*.

[T ] (159) We cannot find a 7 × 7 matrix with *rank*(*A*) = *nullity*(*A*).

/[T ] (160) If *A* is a 5 × 4 matrix with linearly independent columns, then *nullity*(*AT*) = 1.