Topic: Linear Algebra

Subtopic: Row echelon form

Q: Determine which of the following matrices are in row echelon form: a) [(1, 2, 3) (0, 0, 4) (0, 1, 0)] b) [(0, 0, 0, 0) (0, 1, 0, 0) (0, 0,

A: c and d

B: None of them

C: All of them

D: a and b

Q: Reduce the following matrix to ordinary row echelon form (1), determine the rank (2), and identify the basic columns (3): [(1,

A: (1) [(1, 2, 3, 3) (0, 2, 1, 0) (0, 0, 0, 3)] (2) rank=3 (3) A*1, A*2 and A*4

B: (1) [(1, 2, 3, 0) (0, 2, 0, 0) (0, 0, 0, 0)] (2) rank=2 (3) A*1, A*2

C: (1) [(1, 0, 0, 0) (0, 0, 0, 3) (0, 0, 0, 0)] (2) rank=2 (3) A*1 and A*4

D: (1) [(0, 2, 3, 3) (1, 2, 1, 0) (0, 0, 0, 3)] (2) rank=0 (3) A*2

Q: Determine the reduced row echelon form EA of the following matrix (1) and then express each nonbasic column in terms of

A: (1) [(1, 0, 2, 0) (0, 1, 1/2, 0) (0, 0, 0, 1)] (2) A*3=2A*1 + 2 A*2

B: (1) [(1, 0, 2, 0) (0, 1, 1/2, 0) (0, 0, 0, 1)] (2) A*3=2A*1 + 1/2 A*2

C: (1) [(1, 0, 2, 0) (0, 1, 1, 0) (0, 0, 2, 1)] (2) A*3=2A*1 + 1/2 A*2

D: (1) [(1, 0, 0, 0) (0, 1, 0, 0) (0, 0, 1, 1)] (2) A*3=A*1

Q: Determine which of the following systems are consistent: (a) {x + 2y + z = 2, {2x + 4y = 2, {3x + 6y + z = 4. (b) {2x + 2y + 4z =

A: a and c are consistent, while b is inconsistent

B: a and b are consistent, while c is inconsistent

C: All are consistent

D: None of them are consistent

Q: Which of these rules gives a correct definition of the rank of A ? By EA we denote the reduced row echelon form of a matrix

A: All true

B: (a) True (b) False (c) True (d) False

C: (a) False (b) True (c) False (d) True

D: All false

Q: Suppose that [A|b] is reduced to a matrix [E|c]. (a) Is [E|c] in ordinary row echelon form, if E is in ordinary row echelon form

A: (a) No (b) No

B: (a) Yes (b) No

C: (a) No (b) Yes

D: (a) Yes (b) Yes

Subtopic: Matrices

Q: Is this matrix symmetric, skew symmetric or neither? [1, 2, 0] [2, 1, 0]

A: Skew symmetric

B: Neither

C: Symmetric

Q: Let matrices A = [(1, -2, 3) (0, -5, 4) (4, -3, 8)], B = [(1, 2) (0, 4) (3, 7)] and C = [(1) (2) (3)]. Compute the product AB = [(10, 15) (1

A: It exists and it's correct

B: It doesn't exist

C: It exists but it's not correct

Q: What is the 2 by 2 identity matrix I such that I times (x, y) equals (x, y)?

A: I = [(0, 1) (1, 0)]

B: I = [(1, 0) (0, 1)]

C: It doesn't exist

D: I = [(1, 1) (1, 1)]

Q: Is this matrix symmetric, skew symmetric or neither? [1, -3, 3] [-3, 4, -3] [3, 3, 0]

A: Symmetric

B: Skew symmetric

C: Nonsensical

D: Neither

Q: What is the 2 by 2 exchange matrix P such that P times (x, y) equals (y, x)?

A: P = [(1, 0) (0, 1)]

B: P = [(0, 1) (1, 0)]

C: It doesn't exist

D: P = [(1, 1) (1, 1)]

Q: Let matrix A = [(2, 1, 0, 0) (1, 2, 1, 0) (0, 1, 2, 1) (0, 0, 1, 2)] and x = (1, 1, 1, 2). Compute the product Ax by dot products of the r

A: Ax = (4, 3, 5, 5)

B: Ax = (5, 5, 4, 3)

C: Ax = (3, 4, 5, 5)

Q: Is this matrix symmetric, skew symmetric or neither? [0, -3, -3] [3, 0, 1] [3, -1, 0]

A: Neither

B: Symmetric

C: Skew symmetric

Q: Let matrix A = [(1, 2, 4) (-2, 3, 1) (-4, 1, 2)] and x = (2, 2, 3). Compute the product Ax by dot products of the rows with the colu

A: Ax = (-18, -5, 0)

B: Ax = (-18, 5, 0)

C: Ax = (18, -5, 0)

D: Ax = (18, 5, 0)

Q: Consider the following linear system {x + y + z = 2 {x + 2y + z = 3 {2x + 3y + 2z = 5 Determine how many solutions has the sy

A: Infinitely many solutions

B: One solution

C: No solution

Q: Let matrices A = [(1, -2, 3) (0, -5, 4) (4, -3, 8)], B = [(1, 2) (0, 4) (3, 7)] and C = [(1) (2) (3)]. Compute the product CB = [(8, 15) (12

A: It doesn't exist

B: It exists but it's not correct

C: It exists and it's correct

Q: Let matrices A = [(1, -2, 3) (0, -5, 4) (4, -3, 8)], B = [(1, 2) (0, 4) (3, 7)] and C = [(1) (2) (3)]. Compute the product BA = [(10, 15, 8)

A: It doesn't exist

B: It exists and it's correct

C: It exists but it's not correct

Q: Consider the following linear system {x + y + z = 2 {x + 2y + z = 3 {2x + 3y + 2z = 9 Determine how many solutions has the sys

A: No solution

B: Infinitely many solutions

C: One solution

Q: Is this matrix symmetric, skew symmetric or neither? [0, -3, -3] [-3, 0, 3] [-3, 3, 1]

A: Symmetric

B: Skew symmetric

C: Neither

Subtopic: Gaussian elimination

Q: Consider the following linear system: {ax + 3y = 3 {4x + 6y = 6. For which numbers a does elimination break down (1) perma

A: (1) a=2 (2) a=0

B: Any value of a breaks down elimination permanently

C: (1)a=0 (2)a=3

D: (1) a=2 (2) a=4

Q: What multiple L2 of equation 1 should be subtracted from equation 2 to eliminate unknown x in equation 2 ? {2x + 3y = 1 {10

A: L2.1=-5

B: L2.1=10

C: L2.1=2

D: L2.1 =10/2=5

Q: Consider the following linear system: {2x + by = 16 {4x + 8y = g? Choose a coefficient b that makes this system singular, the

A: b=4 and g=32

B: b=4 and g=4

C: b=0 and g=32

D: b=8 and g=4

Q: Use the Gauss-Jordan method to solve the following system: {0x+4y   3z = 3, { x + 7y   5z = 4 { x + 8y   6z = 5 Give the solutio

A: (1, 0, 1)

B: (0, 1, 1)

C: (1, 1, -1)

D: (1, 0, 1)

Q: What multiple of equation 1 should be subtracted from equation 2 below, to eliminate unknown x in equation 2 ? {2x   4y = 6

A: -1/2

B: 2

C: 1

D: 1/2

Q: Consider the following linear system {3x + 2y = 10 {6x + 4y = ? Choose a right side b1 which gives no solution and another r

A: There is no solution to such system

B: b1=(10,20) and b2=(20, 10)

C: There is no solution unless b1=(10,20)

D: b1=(20,10) and b2 can be any other two dimensional vector

Q: Consider the following linear system: {kx + 3y = 6, {3x + ky = 6. For which three numbers k does elimination break down ?(1

A: The only solutions are k=3 and k=-3, and both have only one solution

B: The system has no solution, regardless of the value of k.

C: (1) k=3, k=-3 and k=0 (2) k=0 (3) no solution, infinite solutions and one solution

D: (1) k=3, k=-3 and k=0 (2) k=0 (3) no solution, no solution and infinitely many solutions

Subtopic: Vectors

Q: Let vectors u = (-0.6, 0.8), v = (3, 4) and w = (8, 6). Calculate u * v, u * w, u * (v + w) and w * v.

A: u * v = 1.4; u * w = 0; u * (v + w) = 1.4; w * v = 48

B: u * v = -1.4; u * w = 0; u * (v + w) = 1.4; w * v = 48

C: u * v = 1.4; u * w = 0; u * (v + w) = -1.4; w * v = 48

D: u * v = -1.4; u * w = 0; u * (v + w) = -1.4; w * v = 48

Q: Let vectors u, v and w in three dimensions. Let u be perpendicular to v and w. v and w are parallel.

A: TRUE

B: False, v and w can be any vectors in the plane perpendicular to u

Q: Let vectors v = (2, 1) and w = (1, 2). Find 3v + w and cv + dw.

A: 3v + w = (7, 5) and cv + dw = (2c + d, c + 2d)

B: 3v + w = (7, 5) and cv + dw = (2c + d, -c + 2d)

C: 3v + w = (7, 5) and cv + dw = (c + 2d, c + 2d)

D: 3v + w = (7, -5) and cv + dw = (2c + d, -c + 2d)

Q: Let vectors u, v and w. Let u be perpendicular to v and w. u is perpendicular to v and 2w.

A: FALSE

B: TRUE

Q: Let vectors v = (1, -2, 1) and w = (0, 1, -1). Find cv + dw. Then, find c and d so that cv + dw = (3, 3, -6)

A: cv + dw = (c, -2c + d, c - d); c = 3 and d = 9

B: cv + dw = (c, 2c - d, c - d); c = 3 and d = 9

C: cv + dw = (c, -2c + d, c - d); c = -3 and d = -9

D: cv + dw = (c, -2c + d, c - 2d); c = -3 and d = 9

Q: Let vectors v = (3, 1) and w = (-1, -2). Calculate the angle between these two vectors.

A: 3 /4 radians

B: 2 /3 radians

C: /4 radians

D: -3 /4 radians

Q: Let vectors u = (-0.6, 0.8), v = (3, 4) and w = (8, 6). Compute the lengths of these vectors.

A: u's length = -1, v's length = 5, w's length = 10

B: u's length = 1, v's length = 5, w's length = 11

C: u's length = 1, v's length = 5, w's length = 10

D: u's length = 1, v's length = 6, w's length = 10

Q: Let vectors v = (2, 2, -1) and w = (2, -1, 2). Is the angle between these two vectors 90 (perpendiculars)?

A: TRUE

B: FALSE

Q: Let vectors v and w. v + w = (5, 1) and v - w = (1, 5). Compute v and w.

A: v = (3, 3) and w = (2, -2)

B: v = (5, 2) and w = (4, -3)

C: v = (3, -3) and w = (2, -2)

D: v = (-3, 3) and w = (-2, -2)

Q: Let vectors u and v be perpendicular unit vectors. u-v's length = 2

A: FALSE

B: TRUE