Math Sheet

Name _____ Score _____ Teacher _____ Date _____

Joint Continuous Distributions

Use the stated rectangular or triangular support. Integrate density over area; support restrictions are part of every marginal, conditional, and independence argument.

1. The joint density is constant c on S={(x,y): 0<=x<=3.2, 0<=y<=12.7} and 0 elsewhere. Find E(X).

Assumptions: The density is zero outside the explicitly stated support; all integrals use the shown coordinate units.

Probability is a double integral of density over support. A point has probability 0; conditional and marginal densities include their support restrictions.

2. The joint density is constant c on S={(x,y): x>=0, y>=0, x+y<=6.1} and 0 elsewhere. Find the full marginal densities fX and fY, including support.

Assumptions: The density is zero outside the explicitly stated support; all integrals use the shown coordinate units.

Probability is a double integral of density over support. A point has probability 0; conditional and marginal densities include their support restrictions.

Show support, sums or integrals, and approximation assumptions.

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Joint Continuous Distributions

Use the stated rectangular or triangular support. Integrate density over area; support restrictions are part of every marginal, conditional, and independence argument.

3. **The joint density is constant c on S={(x,y): 0<=x<=4.4, 0<=y<=11.5} and 0 elsewhere. Find P(X<=2.2, Y<=5.75).**

Assumptions: The density is zero outside the explicitly stated support; all integrals use the shown coordinate units.

Probability is a double integral of density over support. A point has probability 0; conditional and marginal densities include their support restrictions.

4. **The joint density is constant c on S={(x,y): 0<=x<=8.4, 0<=y<=7.5} and 0 elsewhere. Find c.**

Assumptions: The density is zero outside the explicitly stated support; all integrals use the shown coordinate units.

Probability is a double integral of density over support. A point has probability 0; conditional and marginal densities include their support restrictions.

Show support, sums or integrals, and approximation assumptions.

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Joint Continuous Distributions

Use the stated rectangular or triangular support. Integrate density over area; support restrictions are part of every marginal, conditional, and independence argument.

5. **The joint density is constant c on S={(x,y): 0<=x<=8.2, 0<=y<=7.7} and 0 elsewhere. Find F(4.1,3.85)=P(X<=4.1,Y<=3.85)**

Assumptions: The density is zero outside the explicitly stated support; all integrals use the shown coordinate units.

Probability is a double integral of density over support. A point has probability 0; conditional and marginal densities include their support restrictions.

6. **The joint density is constant c on S={(x,y): 0<=x<=2.4, 0<=y<=13.5} and 0 elsewhere. Find the full conditional density f(Y | X=1.2), including values outside conditional support.**

Assumptions: The density is zero outside the explicitly stated support; all integrals use the shown coordinate units.

Probability is a double integral of density over support. A point has probability 0; conditional and marginal densities include their support restrictions.

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Joint Continuous Distributions

Use the stated rectangular or triangular support. Integrate density over area; support restrictions are part of every marginal, conditional, and independence argument.

7. **The joint density is constant c on S={(x,y): x>=0, y>=0, x+y<=12.1} and 0 elsewhere. Are X and Y independent? Use density and support reasoning.**

Assumptions: The density is zero outside the explicitly stated support; all integrals use the shown coordinate units.

Probability is a double integral of density over support. A point has probability 0; conditional and marginal densities include their support restrictions.

8. **The joint density is constant c on S={(x,y): 0<=x<=13, 0<=y<=2.9} and 0 elsewhere. Find P(X<=6.5, Y<=1.45).**

Assumptions: The density is zero outside the explicitly stated support; all integrals use the shown coordinate units.

Probability is a double integral of density over support. A point has probability 0; conditional and marginal densities include their support restrictions.

Show support, sums or integrals, and approximation assumptions.

Name _____ Score _____ Teacher _____ Date _____

Joint Continuous Distributions

Worked Answer Key

Use the stated rectangular or triangular support. Integrate density over area; support restrictions are part of every marginal, conditional, and independence argument.

1. The joint density is constant c on S={(x,y): 0<=x<=3.2, 0<=y<=12.7} and 0 elsewhere. Find E(X).

Assumptions: The density is zero outside the explicitly stated support; all integrals use the shown coordinate units.

Probability is a double integral of density over support. A point has probability 0; conditional and marginal densities include their support restrictions.

Answer: E(X)=1.6000

1. The uniform rectangular marginal is uniform on [0,3.2], so E(X)=1.6000.

2. The joint density is constant c on S={(x,y): x>=0, y>=0, x+y<=6.1} and 0 elsewhere. Find the full marginal densities fX and fY, including support.

Assumptions: The density is zero outside the explicitly stated support; all integrals use the shown coordinate units.

Probability is a double integral of density over support. A point has probability 0; conditional and marginal densities include their support restrictions.

Answer: fX(x)=2(6.1-x)/37.21 for 0<=x<=6.1, 0 otherwise; fY(y)=2(6.1-y)/37.21 for 0<=y<=6.1, 0 otherwise

1. Integrate the joint density over the support allowed for the other variable.
2. fX(x)=2(6.1-x)/37.21 for 0<=x<=6.1, 0 otherwise; fY(y)=2(6.1-y)/37.21 for 0<=y<=6.1, 0 otherwise

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Joint Continuous Distributions

Worked Answer Key

Use the stated rectangular or triangular support. Integrate density over area; support restrictions are part of every marginal, conditional, and independence argument.

3. The joint density is constant c on S={(x,y): 0<=x<=4.4, 0<=y<=11.5} and 0 elsewhere. Find P(X<=2.2, Y<=5.75).

Assumptions: The density is zero outside the explicitly stated support; all integrals use the shown coordinate units.

Probability is a double integral of density over support. A point has probability 0; conditional and marginal densities include their support restrictions.

Answer: 0.2500

1. Probability is density times the requested rectangular area: 0.2500.

4. The joint density is constant c on S={(x,y): 0<=x<=8.4, 0<=y<=7.5} and 0 elsewhere. Find c.

Assumptions: The density is zero outside the explicitly stated support; all integrals use the shown coordinate units.

Probability is a double integral of density over support. A point has probability 0; conditional and marginal densities include their support restrictions.

Answer: c=0.0159

1. Support area is 8.4(7.5)=63; c=1/area=0.0159.

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Joint Continuous Distributions

Worked Answer Key

Use the stated rectangular or triangular support. Integrate density over area; support restrictions are part of every marginal, conditional, and independence argument.

5. The joint density is constant c on S={(x,y): 0<=x<=8.2, 0<=y<=7.7} and 0 elsewhere. Find F(4.1,3.85)=P(X<=4.1,Y<=3.85)

Assumptions: The density is zero outside the explicitly stated support; all integrals use the shown coordinate units.

Probability is a double integral of density over support. A point has probability 0; conditional and marginal densities include their support restrictions.

Answer: 0.2500

1. Integrate the density over the support portion below both cutoffs: 0.2500.

6. The joint density is constant c on S={(x,y): 0<=x<=2.4, 0<=y<=13.5} and 0 elsewhere. Find the full conditional density f(Y | X=1.2), including values outside conditional support.

Assumptions: The density is zero outside the explicitly stated support; all integrals use the shown coordinate units.

Probability is a double integral of density over support. A point has probability 0; conditional and marginal densities include their support restrictions.

Answer: 0.0741 for 0<=y<=13.5, and 0 otherwise

1. Divide f(x,y) by fX(x) on the conditional support.
2. 0.0741 for 0<=y<=13.5, and 0 otherwise

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Joint Continuous Distributions

Worked Answer Key

Use the stated rectangular or triangular support. Integrate density over area; support restrictions are part of every marginal, conditional, and independence argument.

7. The joint density is constant c on S={(x,y): x>=0, y>=0, x+y<=12.1} and 0 elsewhere. Are X and Y independent? Use density and support reasoning.

Assumptions: The density is zero outside the explicitly stated support; all integrals use the shown coordinate units.

Probability is a double integral of density over support. A point has probability 0; conditional and marginal densities include their support restrictions.

Answer: not independent

1. The triangular support is not a Cartesian product: allowed y values depend on x, so X and Y are not independent.

8. The joint density is constant c on S={(x,y): 0<=x<=13, 0<=y<=2.9} and 0 elsewhere. Find P(X<=6.5, Y<=1.45).

Assumptions: The density is zero outside the explicitly stated support; all integrals use the shown coordinate units.

Probability is a double integral of density over support. A point has probability 0; conditional and marginal densities include their support restrictions.

Answer: 0.2500

1. Probability is density times the requested rectangular area: 0.2500.