Math Sheet

Name _____ Score _____ Teacher _____ Date _____

Continuous PDFs and CDFs

Treat a density value as height, not probability. Verify nonnegativity and total area 1, use definite integrals for interval probabilities and moments, state the full piecewise CDF including outside the support, and remember that a single point has probability 0. Give exact values where practical; otherwise round the final value to four decimals.

1. Is f(x) = 3/2000 (x + 1)^2 on [-1, 9] and 0 otherwise a valid PDF? Justify both validity conditions.

Given: X is measured in units. The displayed formula applies only on the bounded support [-1, 9]; the density is 0 elsewhere. X is continuous, so endpoints and individual points have probability 0.

2. The CDF is F(x) = 0 for x <= -1; F(x) = (x + 1)^1/11 for -1 < x < 10; F(x) = 1 for x >= 10. Differentiate it to recover the full PDF.

Given: X is measured in units. The displayed formula applies only on the bounded support [-1, 10]; the density is 0 elsewhere. X is continuous, so endpoints and individual points have probability 0.

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3. For the PDF f(x) = 1/8 (x - 2) on [2, 6], find E(X).

Given: X is measured in units. The displayed formula applies only on the bounded support [2, 6]; the density is 0 elsewhere. X is continuous, so endpoints and individual points have probability 0.

4. For f(x) = 1/10 on [-3, 7] and 0 otherwise, derive the full piecewise CDF F(x), including both outside-support branches.

Given: X is measured in units. The displayed formula applies only on the bounded support [-3, 7]; the density is 0 elsewhere. X is continuous, so endpoints and individual points have probability 0.

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5. **For f(x) = 2/121 (x - 3) on [3, 14] and 0 otherwise, find P(3 <= X <= 13).**

Given: X is measured in units. The displayed formula applies only on the bounded support [3, 14]; the density is 0 elsewhere. X is continuous, so endpoints and individual points have probability 0.

6. **On -2 <= x <= 8, let f(x) = k (x + 2)^2, and let f(x) = 0 otherwise. Find k so f is a valid PDF.**

Given: X is measured in units. The displayed formula applies only on the bounded support [-2, 8]; the density is 0 elsewhere. X is continuous, so endpoints and individual points have probability 0.

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7. **For the continuous PDF f(x) = 3/64 (x + 1)^2 on [-1, 3], find P(X = 3).**

Given: X is measured in units. The displayed formula applies only on the bounded support [-1, 3]; the density is 0 elsewhere. X is continuous, so endpoints and individual points have probability 0.

8. **For the PDF f(x) = 1/2 on [0, 2], find Var(X).**

Given: X is measured in units. The displayed formula applies only on the bounded support [0, 2]; the density is 0 elsewhere. X is continuous, so endpoints and individual points have probability 0.