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02405 Probability
2004-5-13
BFN/bfn

Question a)

$$P(X > kY)$$

IMM - DTU

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BFN/bfn

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$$P(X > kY) = P(X - kY > 0)$$

IMM - DTU

02405 Probability
2004-5-13
BFN/bfn

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From the boxed result page 363

IMM - DTU

02405 Probability
2004-5-13
BFN/bfn

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$$P(X > kY) = P(X - kY > 0)$$

From the boxed result page 363 we know that $Z = X - kY$

IMM - DTU

02405 Probability
2004-5-13
BFN/bfn

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From the boxed result page 363 we know that $Z = X - kY$ is *normal*(0, $1 + k^2$) distributed,

IMM - DTU

02405 Probability
2004-5-13
BFN/bfn

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From the boxed result page 363 we know that $Z = X - kY$ is *normal*(0, $1 + k^2$) distributed, thus $P(X - kY > 0)$

IMM - DTU

02405 Probability
2004-5-13
BFN/bfn

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From the boxed result page 363 we know that $Z = X - kY$ is *normal*(0, $1 + k^2$) distributed, thus $P(X - kY > 0) = \frac{1}{2}$.

IMM - DTU

02405 Probability
2004-5-13
BFN/bfn

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Question b) Arguing along the same lines we find

IMM - DTU

02405 Probability
2004-5-13
BFN/bfn

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Question b) Arguing along the same lines we find $P(U > kV)$

IMM - DTU

02405 Probability
2004-5-13
BFN/bfn

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IMM - DTU

02405 Probability
2004-5-13
BFN/bfn

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Question c)

$$P(U^2 + V^2 < 1)$$

IMM - DTU

02405 Probability
2004-5-13
BFN/bfn

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$$P(U^2 + V^2 < 1) = P(3X^2 + Y^2 + 2\sqrt{3}XY + X^2 + 3Y^2 - 2\sqrt{3}XY < 1)$$

IMM - DTU

02405 Probability
2004-5-13
BFN/bfn

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$$P(U^2 + V^2 < 1) = P(3X^2 + Y^2 + 2\sqrt{3}XY + X^2 + 3Y^2 - 2\sqrt{3}XY < 1) = P\left(X^2 + Y^2 < \frac{1}{4}\right)$$

(now using $X^2 + Y^2 \in$

IMM - DTU

02405 Probability
2004-5-13
BFN/bfn

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(now using $X^2 + Y^2 \in exponential(0.5)$)

IMM - DTU

02405 Probability
2004-5-13
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IMM - DTU

02405 Probability
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(now using $X^2 + Y^2 \in exponential(0.5)$ (page 360, 364-366, 485))

$$= 1 - e^{-\frac{1}{8}}$$

IMM - DTU

02405 Probability
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(now using $X^2 + Y^2 \in exponential(0.5)$ (page 360, 364-366, 485))

$$= 1 - e^{-\frac{1}{8}} = 0.118$$

IMM - DTU

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Question d)

X

IMM - DTU

02405 Probability
2004-5-13
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(now using $X^2 + Y^2 \in exponential(0.5)$ (page 360, 364-366, 485))

$$= 1 - e^{-\frac{1}{8}} = 0.118$$

Question d)

$$X = v + \sqrt{3}Y \in normal(v, 3)$$