MITx: 6.041x Introduction to Probability - The Science of Uncertainty

Exercise: Sum of normals

(3/3 points)
Let X and Y be independent normal random variables.

a) Is $2X - 4$ always normal?

True ✔ **Answer:** True

b) Is $3X - 4Y$ always normal?

True ✔ **Answer:** True

c) Is $X^2 + Y$ always normal?

False ✔ **Answer:** False

Answer:
a) This is a fact that we are already familiar with: a linear function of a normal random variable is normal.

b) Since X and Y are independent and normal, the random variables $3X$ and $-4Y$ are also independent and normal. Since the sum of independent normals is normal, it follows that $3X - 4Y$ is normal.

c) There is no reason for this to be the case. To see this, consider an extreme case where $Y = 0$ (a degenerate case of a normal). Then the random variable $X^2 + Y$ is nonnegative, which is incompatible with having a normal distribution.

You have used 1 of 1 submissions