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Homework 3

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**Problem 1**

Solution: a

**Problem 2**

Due to constraints on the gamma function we are unable to compute probabilities for the range [-Inf, 0).

P(X=1) is:

[1] 0.2707

P(-2<X<4) is:

[1] 0.9473

**Problem 3**

n = 3 children

p = 0.25 probability of being albino

**Problem 4**

P(Y=<2)

[1] 0.9844

E(Y)

[1] 0.7500

Var(Y)

[1] 1.0000

**Problem 5**

P(1<X<4)

[1] 0.5398

E(X)

[1] 3.0000

Var(X)

[1] 6.0000

100,000 random draws and P(1<X<4)

[1] 0.5381

The Monte Carlo approximation was extremely accurate with a 0.1% relative error. This is in strict, but not complete, agreement with the analytical solution.

**Problem 6**

E(Y)

[1] 10

Var(Y)

[1] 20

Does E(Y) == 10?

[1] TRUE

Y follows a Chi-square distribution that has been transformed by the function Y = 4X -10 from the Chi-square distribution of X with E(X) = 5 and Var(X) = 10.

**Problem 7**

P(1<X<1.6)

[1] 0.4332

500000 random draws and P(1<X<1.6)

[1] 0.4321

Probability that 2 out of 5 patients have gene expression value (1.0, 1.6)

binomial (n = 5, p = 0.4321)

[1] 0.6257

See code for implementation.

**Problem 8**

See code for implementation. The relative errors for the function and formulaic based mean calculations are on average ~0.1% different. However, the relative errors for the function and formulaic based variance calculations average 9%. This difference could be attributed to the difficulty in measuring the variance of this distribution as it represents a scale-free function.