Charles Valentine

Homework 3

9/25/2016

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.