HW2

R Markdown

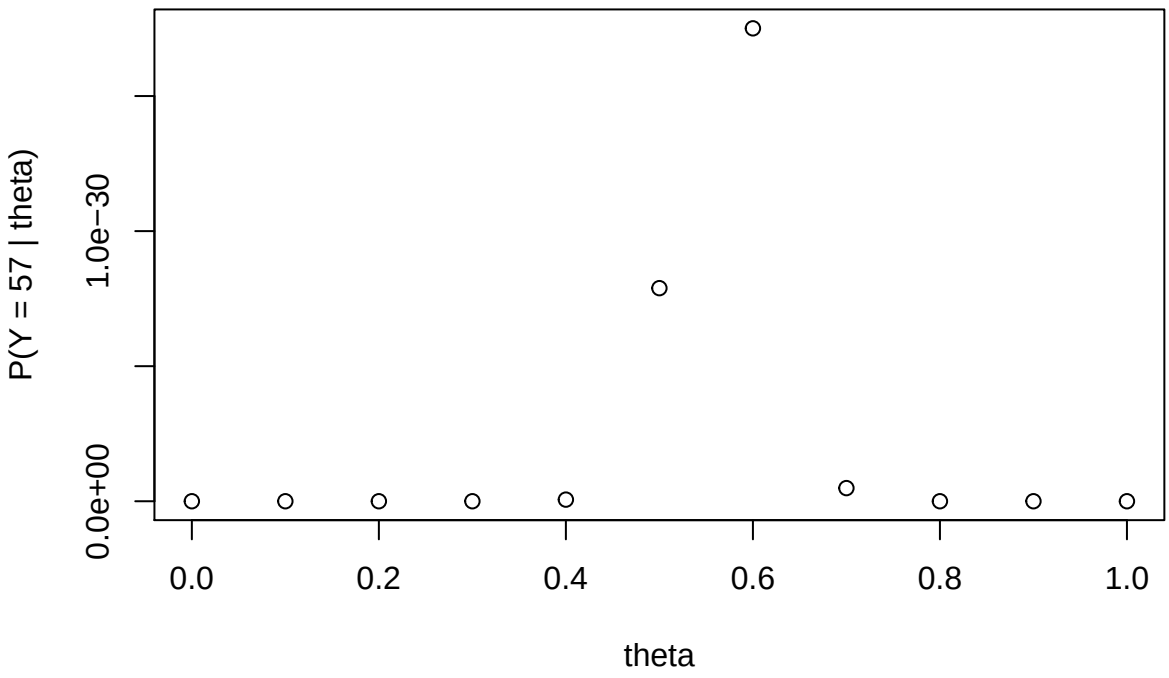
```
theta <- c(0,.1,.2,.3,.4,.5,.6,.7,.8,.9,1)
```

```
#P(Y=57 | theta)
prob <- c(0,0,0,0,0,0,0,0,0,0,0)
for (i in 1:11)
{
prob[i] <- theta[i]^57 * (1-theta[i])^43
}
prob
```

```
##  [1] 0.000000e+00 1.077526e-59 9.807971e-45 3.428682e-37 5.996851e-33
##  [6] 7.888609e-31 1.750656e-30 4.861858e-32 2.632807e-36 2.465035e-46
## [11] 0.000000e+00
```

Part B

```
plot(x = theta, y = prob, ylab = "P(Y = 57 | theta)")
```




```
sum(prob)
```

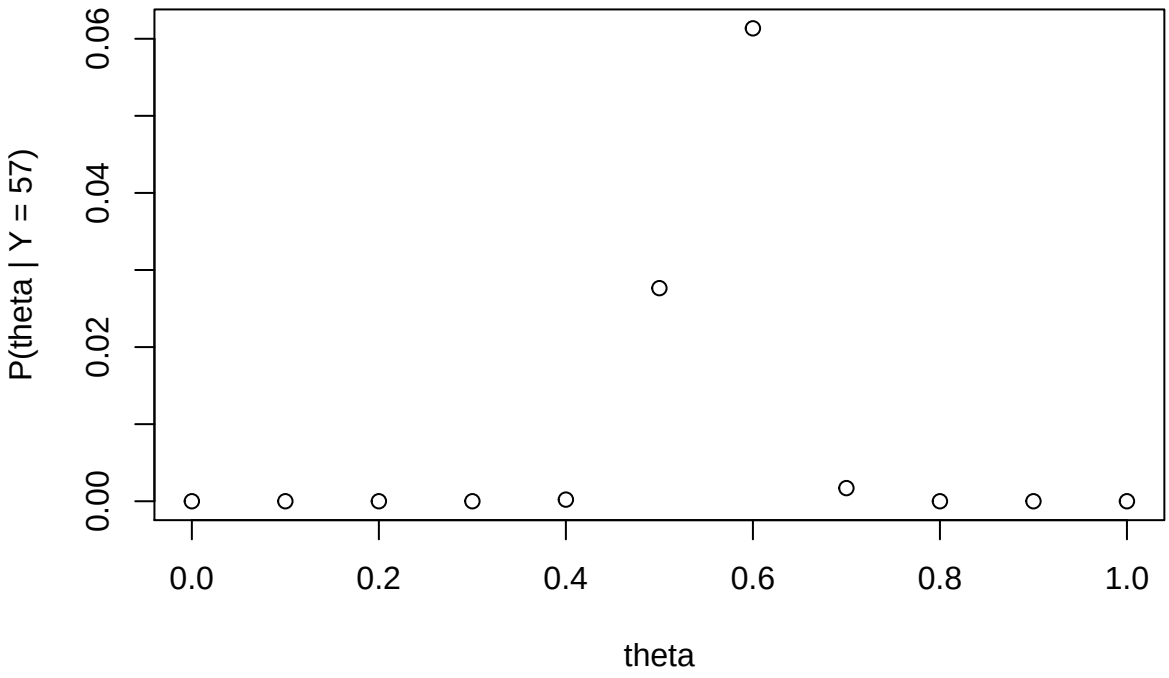
```
## [1] 2.594136e-30
```

```
# P(theta | Y = 57)
prob_c <- c(0,0,0,0,0,0,0,0,0,0,0)
for (i in 1:11)
{
prob_c[i] <- prob[i] * (1/11) / sum(prob)
}
prob_c
```

```
##  [1] 0.000000e+00 3.776092e-31 3.437113e-16 1.201550e-08 2.101541e-04
##  [6] 2.764490e-02 6.135014e-02 1.703793e-03 9.226430e-08 8.638487e-18
## [11] 0.000000e+00
```

Part C

```
plot(x = theta, y = prob_c, ylab = "P(theta | Y = 57)")
```



Part D

```
theta_cont <- seq(from = 0, to = 1, by = .001)
prob_cont <- c()
for (i in theta_cont)
{
p <- i^57 * (1-i)^43
prob_cont <- append(prob_cont, p)
}
prob_cont
```

```
##    [1]  0.000000e+00 9.578908e-172 1.322279e-154 1.379759e-144 1.748119e-137
##    [6] 5.593488e-132 1.746770e-127 1.094979e-123 2.119001e-120 1.671053e-117
##   [11] 6.491026e-115 1.421751e-112 1.940348e-110 1.779953e-108 1.164140e-106
##   [16] 5.688001e-105 2.155898e-103 6.537170e-102 1.626772e-100  3.394084e-99
##   [21]  6.045483e-98  9.335886e-97  1.266670e-95  1.527400e-94  1.653419e-93
##   [26]  1.620985e-92  1.450494e-91  1.192852e-90  9.071042e-90  6.413761e-89
##   [31]  4.237367e-88  2.627477e-87  1.535285e-86  8.484631e-86  4.449536e-85
##   [36]  2.221023e-84  1.058169e-83  4.824237e-83  2.109566e-82  8.867236e-82
##   [41]  3.589901e-81  1.402426e-80  5.295737e-80  1.936044e-79  6.862651e-79
##   [46]  2.361882e-78  7.902719e-78  2.573787e-77  8.168444e-77  2.528942e-76
##   [51]  7.645489e-76  2.259161e-75  6.530540e-75  1.848305e-74  5.125818e-74
##   [56]  1.393930e-73  3.719746e-73  9.746968e-73  2.509484e-72  6.352117e-72
```

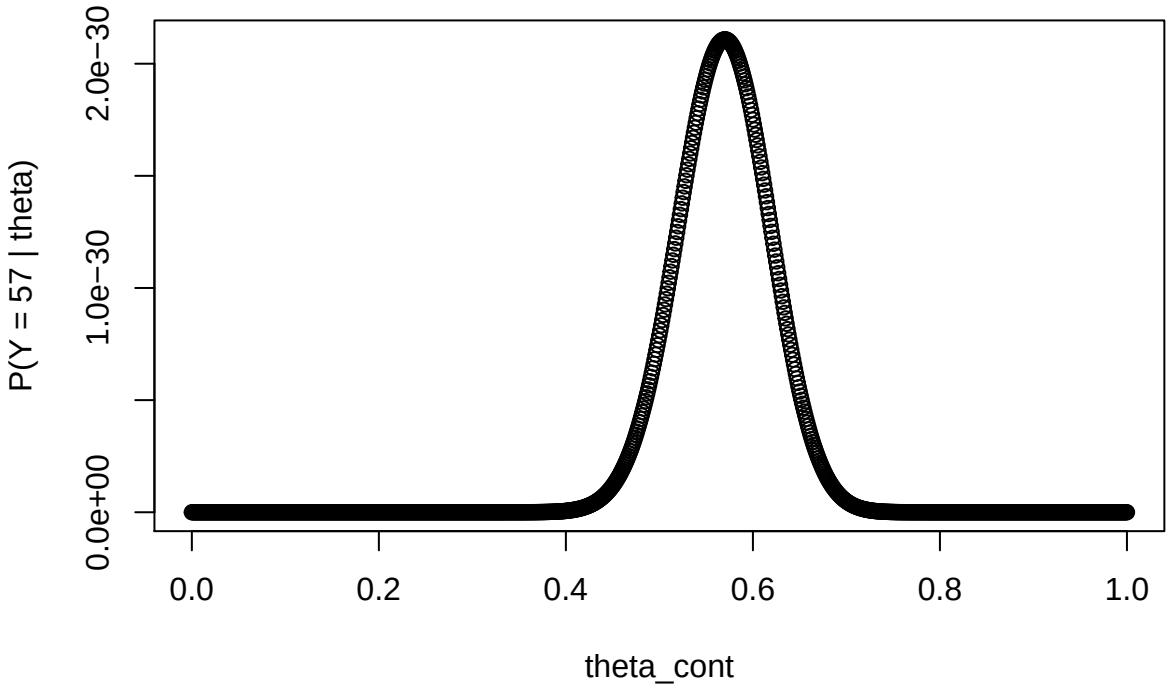
```
##   [61]  1.581681e-71  3.876333e-71  9.355098e-71  2.224404e-70  5.213388e-70
##   [66]  1.204927e-69  2.747388e-69  6.182647e-69  1.373701e-68  3.014633e-68
##   [71]  6.536648e-68  1.400882e-67  2.968351e-67  6.220590e-67  1.289676e-66
##   [76]  2.645980e-66  5.373652e-66  1.080549e-65  2.151899e-65  4.245299e-65
##   [81]  8.298619e-65  1.607730e-64  3.087627e-64  5.879396e-64  1.110260e-63
##   [86]  2.079629e-63  3.864543e-63  7.125918e-63  1.304038e-62  2.368757e-62
##   [91]  4.271721e-62  7.649030e-62  1.360184e-61  2.402378e-61  4.215025e-61
##   [96]  7.347412e-61  1.272632e-60  2.190595e-60  3.747723e-60  6.373414e-60
##  [101]  1.077526e-59  1.811278e-59  3.027557e-59  5.032652e-59  8.320411e-59
##  [106]  1.368298e-58  2.238451e-58  3.643242e-58  5.899875e-58  9.507179e-58
##  [111]  1.524591e-57  2.433243e-57  3.865314e-57  6.112050e-57  9.621141e-57
##  [116]  1.507778e-56  2.352625e-56  3.655143e-56  5.654882e-56  8.712461e-56
##  [121]  1.336860e-55  2.043091e-55  3.110101e-55  4.716001e-55  7.123815e-55
##  [126]  1.072055e-54  1.607358e-54  2.401179e-54  3.574186e-54  5.301444e-54
##  [131]  7.836081e-54  1.154288e-53  1.694581e-53  2.479504e-53  3.616120e-53
##  [136]  5.256751e-53  7.617434e-53  1.100364e-52  1.584603e-52  2.274988e-52
##  [141]  3.256353e-52  4.647244e-52  6.612855e-52  9.382736e-52  1.327498e-51
##  [146]  1.872919e-51  2.635125e-51  3.697400e-51  5.173928e-51  7.220851e-51
##  [151]  1.005115e-50  1.395458e-50  1.932441e-50  2.669305e-50  3.677957e-50
##  [156]  5.055281e-50  6.931501e-50  9.481257e-50  1.293820e-49  1.761424e-49
##  [161]  2.392480e-49  3.242196e-49  4.383779e-49  5.914093e-49  7.961030e-49
##  [166]  1.069309e-48  1.433182e-48  1.916787e-48  2.558186e-48  3.407110e-48
##  [171]  4.528418e-48  6.006522e-48  7.951077e-48  1.050424e-47  1.384998e-47
##  [176]  1.822588e-47  2.393824e-47  3.138117e-47  4.106088e-47  5.362639e-47
##  [181]  6.990825e-47  9.096756e-47  1.181575e-46  1.532006e-46  1.982863e-46
##  [186]  2.561921e-46  3.304359e-46  4.254662e-46  5.468984e-46  7.018100e-46
##  [191]  8.991064e-46  1.149975e-45  1.468448e-45  1.872098e-45  2.382898e-45
##  [196]  3.028278e-45  3.842432e-45  4.867919e-45  6.157631e-45  7.777205e-45
##  [201]  9.807971e-45  1.235056e-44  1.552932e-44  1.949764e-44  2.444452e-44
##  [206]  3.060248e-44  3.825720e-44  4.775917e-44  5.953782e-44  7.411858e-44
##  [211]  9.214350e-44  1.143961e-43  1.418311e-43  1.756107e-43  2.171474e-43
##  [216]  2.681560e-43  3.307155e-43  4.073433e-43  5.010840e-43  6.156147e-43
##  [221]  7.553717e-43  9.257000e-43  1.133032e-42  1.385100e-42  1.691185e-42
##  [226]  2.062418e-42  2.512131e-42  3.056273e-42  3.713900e-42  4.507760e-42
##  [231]  5.464971e-42  6.617828e-42  8.004747e-42  9.671373e-42  1.167188e-41
##  [236]  1.407051e-41  1.694332e-41  2.038031e-41  2.448783e-41  2.939142e-41
##  [241]  3.523914e-41  4.220538e-41  5.049539e-41  6.035044e-41  7.205387e-41
##  [246]  8.593810e-41  1.023927e-40  1.218738e-40  1.449149e-40  1.721393e-40
##  [251]  2.042748e-40  2.421700e-40  2.868135e-40  3.393560e-40  4.011358e-40
##  [256]  4.737072e-40  5.588744e-40  6.587294e-40  7.756953e-40  9.125770e-40
##  [261]  1.072617e-39  1.259563e-39  1.477737e-39  1.732127e-39  2.028476e-39
##  [266]  2.373397e-39  2.774494e-39  3.240506e-39  3.781462e-39  4.408869e-39
##  [271]  5.135912e-39  5.977689e-39  6.951473e-39  8.077009e-39  9.376846e-39
##  [276]  1.087672e-38  1.260596e-38  1.459801e-38  1.689090e-38  1.952792e-38
##  [281]  2.255824e-38  2.603769e-38  3.002965e-38  3.460593e-38  3.984789e-38
##  [286]  4.584762e-38  5.270927e-38  6.055052e-38  6.950428e-38  7.972047e-38
##  [291]  9.136816e-38  1.046378e-37  1.197437e-37  1.369270e-37  1.564588e-37
##  [296]  1.786434e-37  2.038224e-37  2.323788e-37  2.647420e-37  3.013925e-37
##  [301]  3.428682e-37  3.897704e-37  4.427707e-37  5.026194e-37  5.701532e-37
##  [306]  6.463049e-37  7.321137e-37  8.287365e-37  9.374603e-37  1.059716e-36
##  [311]  1.197092e-36  1.351353e-36  1.524455e-36  1.718569e-36  1.936096e-36
##  [316]  2.179697e-36  2.452314e-36  2.757200e-36  3.097947e-36  3.478522e-36
##  [321]  3.903301e-36  4.377107e-36  4.905254e-36  5.493594e-36  6.148561e-36
##  [326]  6.877234e-36  7.687387e-36  8.587558e-36  9.587113e-36  1.069632e-35
```

```
##  [331] 1.192645e-35 1.328981e-35 1.479990e-35 1.647146e-35 1.832063e-35
##  [336] 2.036502e-35 2.262383e-35 2.511806e-35 2.787055e-35 3.090620e-35
##  [341] 3.425212e-35 3.793783e-35 4.199538e-35 4.645963e-35 5.136843e-35
##  [346] 5.676287e-35 6.268748e-35 6.919056e-35 7.632442e-35 8.414568e-35
##  [351] 9.271561e-35 1.021004e-34 1.123717e-34 1.236068e-34 1.358890e-34
##  [356] 1.493083e-34 1.639616e-34 1.799534e-34 1.973962e-34 2.164108e-34
##  [361] 2.371272e-34 2.596853e-34 2.842351e-34 3.109376e-34 3.399655e-34
##  [366] 3.715040e-34 4.057513e-34 4.429199e-34 4.832368e-34 5.269450e-34
##  [371] 5.743041e-34 6.255912e-34 6.811022e-34 7.411527e-34 8.060791e-34
##  [376] 8.762399e-34 9.520166e-34 1.033815e-33 1.122068e-33 1.217233e-33
##  [381] 1.319799e-33 1.430282e-33 1.549231e-33 1.677228e-33 1.814890e-33
##  [386] 1.962870e-33 2.121858e-33 2.292585e-33 2.475823e-33 2.672387e-33
##  [391] 2.883139e-33 3.108986e-33 3.350887e-33 3.609849e-33 3.886937e-33
##  [396] 4.183267e-33 4.500015e-33 4.838417e-33 5.199771e-33 5.585439e-33
##  [401] 5.996851e-33 6.435505e-33 6.902969e-33 7.400889e-33 7.930982e-33
##  [406] 8.495048e-33 9.094965e-33 9.732696e-33 1.041029e-32 1.112987e-32
##  [411] 1.189368e-32 1.270403e-32 1.356333e-32 1.447409e-32 1.543892e-32
##  [416] 1.646053e-32 1.754172e-32 1.868543e-32 1.989465e-32 2.117254e-32
##  [421] 2.252233e-32 2.394736e-32 2.545111e-32 2.703715e-32 2.870917e-32
##  [426] 3.047097e-32 3.232649e-32 3.427975e-32 3.633491e-32 3.849624e-32
##  [431] 4.076813e-32 4.315507e-32 4.566169e-32 4.829272e-32 5.105298e-32
##  [436] 5.394745e-32 5.698117e-32 6.015932e-32 6.348716e-32 6.697006e-32
##  [441] 7.061350e-32 7.442303e-32 7.840430e-32 8.256306e-32 8.690511e-32
##  [446] 9.143635e-32 9.616274e-32 1.010903e-31 1.062251e-31 1.115733e-31
##  [451] 1.171410e-31 1.229345e-31 1.289599e-31 1.352236e-31 1.417318e-31
##  [456] 1.484907e-31 1.555066e-31 1.627856e-31 1.703341e-31 1.781581e-31
##  [461] 1.862636e-31 1.946568e-31 2.033436e-31 2.123297e-31 2.216210e-31
##  [466] 2.312230e-31 2.411411e-31 2.513808e-31 2.619472e-31 2.728453e-31
##  [471] 2.840798e-31 2.956553e-31 3.075761e-31 3.198464e-31 3.324700e-31
##  [476] 3.454505e-31 3.587911e-31 3.724948e-31 3.865643e-31 4.010018e-31
##  [481] 4.158094e-31 4.309886e-31 4.465405e-31 4.624660e-31 4.787654e-31
##  [486] 4.954387e-31 5.124854e-31 5.299044e-31 5.476942e-31 5.658531e-31
##  [491] 5.843784e-31 6.032672e-31 6.225160e-31 6.421207e-31 6.620767e-31
##  [496] 6.823789e-31 7.030215e-31 7.239982e-31 7.453022e-31 7.669257e-31
##  [501] 7.888609e-31 8.110989e-31 8.336305e-31 8.564458e-31 8.795341e-31
##  [506] 9.028843e-31 9.264847e-31 9.503229e-31 9.743860e-31 9.986602e-31
##  [511] 1.023132e-30 1.047785e-30 1.072606e-30 1.097577e-30 1.122684e-30
##  [516] 1.147907e-30 1.173231e-30 1.198637e-30 1.224106e-30 1.249619e-30
##  [521] 1.275157e-30 1.300700e-30 1.326228e-30 1.351719e-30 1.377153e-30
##  [526] 1.402509e-30 1.427763e-30 1.452895e-30 1.477881e-30 1.502700e-30
##  [531] 1.527329e-30 1.551744e-30 1.575922e-30 1.599841e-30 1.623477e-30
##  [536] 1.646806e-30 1.669807e-30 1.692454e-30 1.714726e-30 1.736598e-30
##  [541] 1.758049e-30 1.779056e-30 1.799595e-30 1.819646e-30 1.839185e-30
##  [546] 1.858192e-30 1.876646e-30 1.894525e-30 1.911809e-30 1.928479e-30
##  [551] 1.944515e-30 1.959899e-30 1.974613e-30 1.988639e-30 2.001961e-30
##  [556] 2.014561e-30 2.026426e-30 2.037541e-30 2.047891e-30 2.057465e-30
##  [561] 2.066249e-30 2.074233e-30 2.081406e-30 2.087759e-30 2.093283e-30
##  [566] 2.097971e-30 2.101817e-30 2.104815e-30 2.106960e-30 2.108249e-30
##  [571] 2.108678e-30 2.108248e-30 2.106957e-30 2.104806e-30 2.101796e-30
##  [576] 2.097931e-30 2.093213e-30 2.087647e-30 2.081240e-30 2.073998e-30
##  [581] 2.065928e-30 2.057039e-30 2.047341e-30 2.036845e-30 2.025562e-30
##  [586] 2.013504e-30 2.000685e-30 1.987120e-30 1.972822e-30 1.957808e-30
##  [591] 1.942095e-30 1.925700e-30 1.908641e-30 1.890937e-30 1.872608e-30
##  [596] 1.853673e-30 1.834153e-30 1.814069e-30 1.793444e-30 1.772299e-30
```

```
##  [601] 1.750656e-30 1.728540e-30 1.705973e-30 1.682979e-30 1.659581e-30
##  [606] 1.635805e-30 1.611674e-30 1.587212e-30 1.562446e-30 1.537398e-30
##  [611] 1.512094e-30 1.486558e-30 1.460815e-30 1.434890e-30 1.408806e-30
##  [616] 1.382589e-30 1.356261e-30 1.329847e-30 1.303370e-30 1.276853e-30
##  [621] 1.250319e-30 1.223791e-30 1.197290e-30 1.170838e-30 1.144456e-30
##  [626] 1.118164e-30 1.091983e-30 1.065932e-30 1.040031e-30 1.014296e-30
##  [631] 9.887476e-31 9.634013e-31 9.382740e-31 9.133815e-31 8.887393e-31
##  [636] 8.643617e-31 8.402627e-31 8.164555e-31 7.929526e-31 7.697658e-31
##  [641] 7.469062e-31 7.243842e-31 7.022096e-31 6.803913e-31 6.589377e-31
##  [646] 6.378564e-31 6.171543e-31 5.968378e-31 5.769124e-31 5.573830e-31
##  [651] 5.382540e-31 5.195289e-31 5.012108e-31 4.833022e-31 4.658047e-31
##  [656] 4.487198e-31 4.320479e-31 4.157892e-31 3.999434e-31 3.845094e-31
##  [661] 3.694858e-31 3.548708e-31 3.406619e-31 3.268563e-31 3.134508e-31
##  [666] 3.004419e-31 2.878254e-31 2.755971e-31 2.637521e-31 2.522856e-31
##  [671] 2.411921e-31 2.304662e-31 2.201019e-31 2.100932e-31 2.004338e-31
##  [676] 1.911171e-31 1.821366e-31 1.734853e-31 1.651563e-31 1.571425e-31
##  [681] 1.494366e-31 1.420315e-31 1.349197e-31 1.280939e-31 1.215465e-31
##  [686] 1.152700e-31 1.092570e-31 1.035000e-31 9.799153e-32 9.272405e-32
##  [691] 8.769019e-32 8.288259e-32 7.829395e-32 7.391703e-32 6.974469e-32
##  [696] 6.576987e-32 6.198559e-32 5.838501e-32 5.496138e-32 5.170807e-32
##  [701] 4.861858e-32 4.568652e-32 4.290568e-32 4.026993e-32 3.777332e-32
##  [706] 3.541003e-32 3.317441e-32 3.106092e-32 2.906420e-32 2.717903e-32
##  [711] 2.540036e-32 2.372327e-32 2.214301e-32 2.065498e-32 1.925473e-32
##  [716] 1.793797e-32 1.670055e-32 1.553848e-32 1.444791e-32 1.342513e-32
##  [721] 1.246659e-32 1.156887e-32 1.072868e-32 9.942899e-33 9.208498e-33
##  [726] 8.522602e-33 7.882456e-33 7.285431e-33 6.729015e-33 6.210815e-33
##  [731] 5.728552e-33 5.280056e-33 4.863263e-33 4.476214e-33 4.117047e-33
##  [736] 3.783998e-33 3.475396e-33 3.189657e-33 2.925285e-33 2.680864e-33
##  [741] 2.455059e-33 2.246610e-33 2.054329e-33 1.877097e-33 1.713862e-33
##  [746] 1.563635e-33 1.425486e-33 1.298544e-33 1.181991e-33 1.075062e-33
##  [751] 9.770401e-34 8.872548e-34 8.050803e-34 7.299324e-34 6.612662e-34
##  [756] 5.985740e-34 5.413833e-34 4.892546e-34 4.417794e-34 3.985787e-34
##  [761] 3.593008e-34 3.236199e-34 2.912343e-34 2.618651e-34 2.352543e-34
##  [766] 2.111640e-34 1.893746e-34 1.696838e-34 1.519053e-34 1.358678e-34
##  [771] 1.214139e-34 1.083990e-34 9.669066e-35 8.616740e-35 7.671807e-35
##  [776] 6.824099e-35 6.064331e-35 5.384026e-35 4.775457e-35 4.231583e-35
##  [781] 3.745999e-35 3.312881e-35 2.926942e-35 2.583384e-35 2.277859e-35
##  [786] 2.006431e-35 1.765539e-35 1.551968e-35 1.362813e-35 1.195459e-35
##  [791] 1.047548e-35 9.169589e-36 8.017865e-36 7.003200e-36 6.110252e-36
##  [796] 5.325279e-36 4.635985e-36 4.031382e-36 3.501658e-36 3.038064e-36
##  [801] 2.632807e-36 2.278955e-36 1.970345e-36 1.701507e-36 1.467594e-36
##  [806] 1.264310e-36 1.087857e-36 9.348798e-37 8.024175e-37 6.878607e-37
##  [811] 5.889127e-37 5.035543e-37 4.300126e-37 3.667332e-37 3.123544e-37
##  [816] 2.656856e-37 2.256864e-37 1.914494e-37 1.621840e-37 1.372022e-37
##  [821] 1.159064e-37 9.777781e-38 8.236709e-38 6.928529e-38 5.819635e-38
##  [826] 4.881026e-38 4.087713e-38 3.418192e-38 2.853990e-38 2.379255e-38
##  [831] 1.980409e-38 1.645836e-38 1.365616e-38 1.131288e-38 9.356484e-39
##  [836] 7.725715e-39 6.368590e-39 5.241047e-39 4.305808e-39 3.531380e-39
##  [841] 2.891203e-39 2.362915e-39 1.927720e-39 1.569845e-39 1.276078e-39
##  [846] 1.035370e-39 8.384973e-40 6.777756e-40 5.468118e-40 4.402984e-40
##  [851] 3.538367e-40 2.837883e-40 2.271489e-40 1.814430e-40 1.446343e-40
##  [856] 1.150516e-40 9.132543e-41 7.233633e-41 5.717079e-41 4.508501e-41
##  [861] 3.547458e-41 2.784941e-41 2.181297e-41 1.704511e-41 1.328790e-41
##  [866] 1.033404e-41 8.017264e-42 6.204533e-42 4.789646e-42 3.688017e-42
```

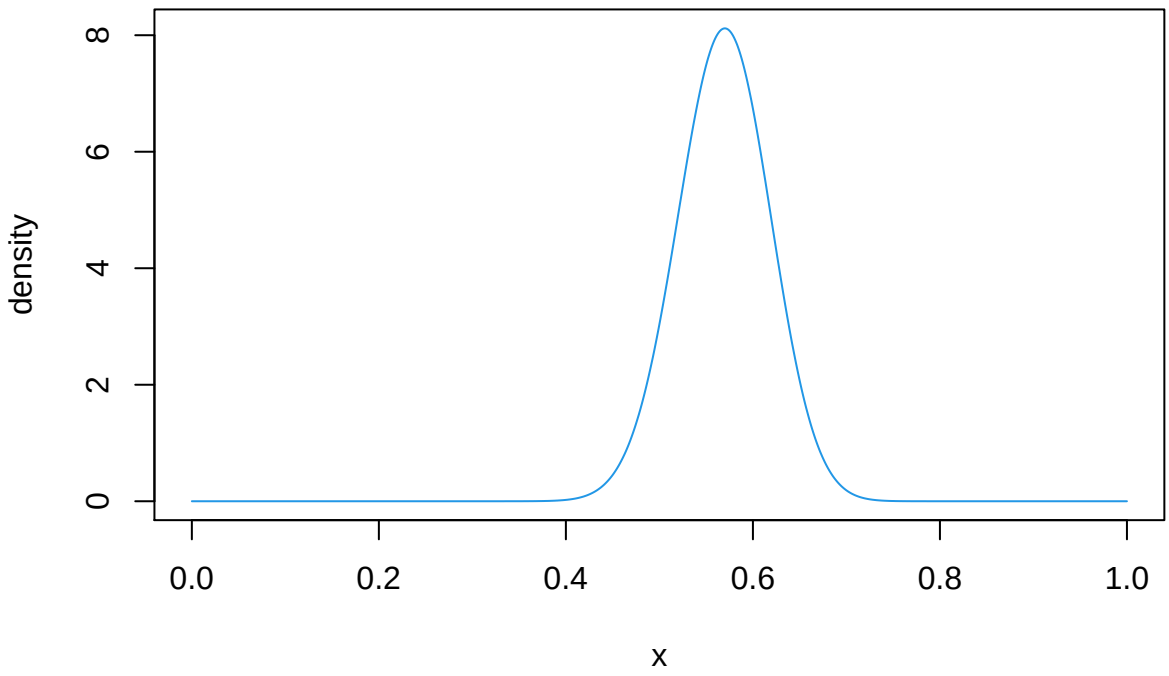
```
##  [871]  2.832445e-42  2.169663e-42  1.657556e-42  1.262909e-42  9.595886e-43
##  [876]  7.270924e-43  5.493720e-43  4.139011e-43  3.109282e-43  2.328825e-43
##  [881]  1.739025e-43  1.294631e-43  9.608059e-44  7.108078e-44  5.241706e-44
##  [886]  3.852774e-44  2.822479e-44  2.060722e-44  1.499388e-44  1.087147e-44
##  [891]  7.854451e-45  5.654166e-45  4.055255e-45  2.897581e-45  2.062485e-45
##  [896]  1.462355e-45  1.032738e-45  7.263901e-46  5.088134e-46  3.549127e-46
##  [901]  2.465035e-46  1.704616e-46  1.173529e-46  8.042412e-47  5.486098e-47
##  [906]  3.724638e-47  2.516547e-47  1.691929e-47  1.131801e-47  7.532189e-48
##  [911]  4.986402e-48  3.283354e-48  2.150110e-48  1.400110e-48  9.064974e-49
##  [916]  5.834668e-49  3.732942e-49  2.373614e-49  1.499783e-49  9.415426e-50
##  [921]  5.871859e-50  3.637172e-50  2.237332e-50  1.366464e-50  8.284892e-51
##  [926]  4.985550e-51  2.977078e-51  1.763713e-51  1.036411e-51  6.039552e-52
##  [931]  3.489344e-52  1.998217e-52  1.133940e-52  6.374854e-53  3.549451e-53
##  [936]  1.956754e-53  1.067732e-53  5.765013e-54  3.078963e-54  1.626004e-54
##  [941]  8.487727e-55  4.377690e-55  2.230002e-55  1.121464e-55  5.565303e-56
##  [946]  2.724010e-56  1.314397e-56  6.249010e-57  2.925627e-57  1.348006e-57
##  [951]  6.108797e-58  2.720952e-58  1.190363e-58  5.110969e-59  2.152009e-59
##  [956]  8.878309e-60  3.585626e-60  1.416198e-60  5.464539e-61  2.057626e-61
##  [961]  7.551616e-62  2.697809e-62  9.368580e-63  3.157712e-63  1.031332e-63
##  [966]  3.258238e-64  9.937786e-65  2.920172e-65  8.247920e-66  2.233614e-66
##  [971]  5.783661e-67  1.427611e-67  3.347900e-68  7.431453e-69  1.554943e-69
##  [976]  3.052695e-70  5.594007e-71  9.512334e-72  1.491042e-72  2.138174e-73
##  [981]  2.780841e-74  3.247419e-75  3.365678e-76  3.053895e-77  2.387151e-78
##  [986]  1.576846e-79  8.599826e-81  3.763933e-82  1.276261e-83  3.206816e-85
##  [991]  5.639052e-87  6.436151e-89  4.305611e-91  1.463265e-93  2.048933e-96
##  [996] 8.543303e-100 6.156897e-104 2.765910e-109 7.847488e-117 9.445671e-130
## [1001]  0.000000e+00
```

```
plot(x = theta_cont, y = prob_cont, ylab = "P(Y = 57 | theta)")
```



Part E

```
x = seq(0,1, by = .001)
plot(x, dbeta(x, 58, 44), ylab="density", type ="l", col=4)
```



They all appear to be similar beta distributions but scaled differently. Plot C is a posterior with the prior being uniform probability of each theta occuring. Plot B has no prior information given to us. Plot D and plot E should be the exact same beta distribution but scaled differently. Plot D uses the prior of uniform pdf for theta, whereas E is the true posterior distribution.