Values can be in the range 0 to $2^{32} - 1$

If you then divide by 2^{32} you get values in the range $[0, 1]$.

In [47]:

```
x = 1987 #seed
a = 69069
c = 1
m = 2^32
nextX = (a*x + c) % m
nextX2 = (a*nextX + c) % m
tup = x, nextX, nextX2
tup, tup./m
```

Out[47]:

```
((1987, 137240104, 43920905), (4.6263448894023895e-7, 0.03195370174944
401, 0.010226132581010 46))
```

In [40]:

```
zeros(Float64,10)
```

Out[40]:

```
10-element Array{Float64,1}:
 0.0
 0.0
 0.0
 0.0
 0.0
 0.0
 0.0
 0.0
 0.0
 0.0
```

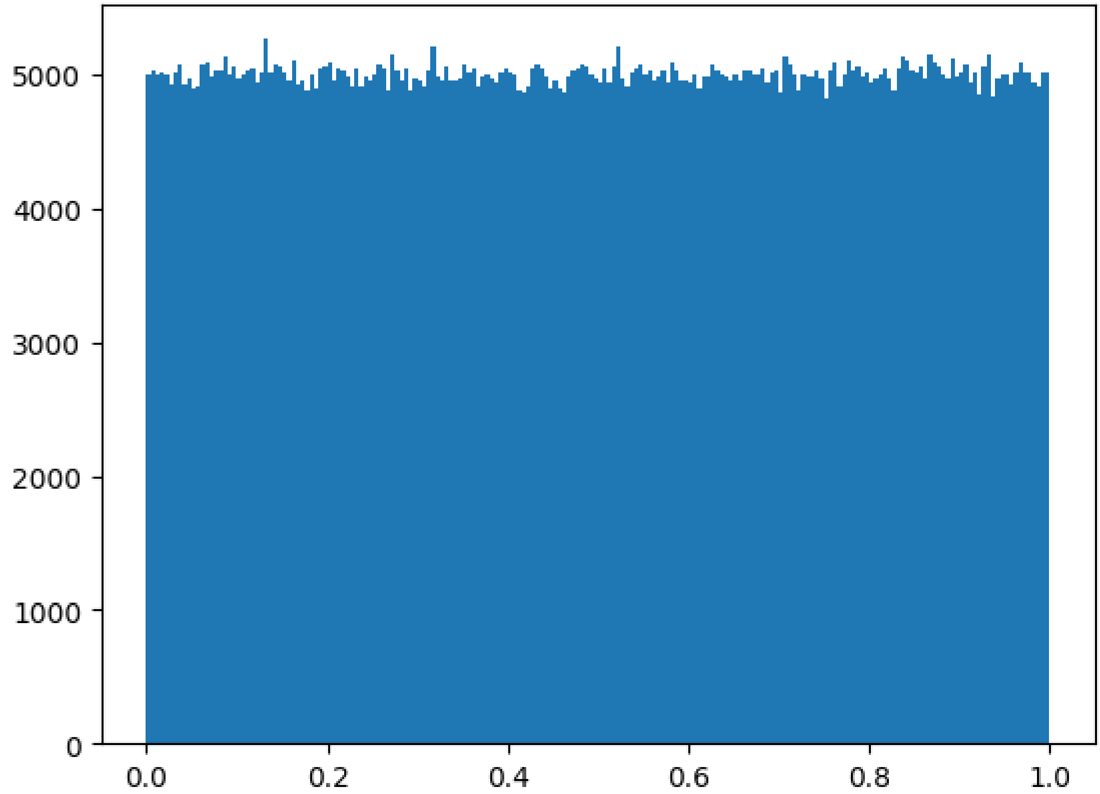
Our try at a random number generator

In [72]:

```
using Statistics,PyPlot

function myRand(seed,n)
   a, c, m = 69069, 1, 2^32
   x = seed
   arr = zeros(Float64,n)
   for i in 1:n
        x = (a*x + c) % m
        # put the random value in the array...
        arr[i] = x/m
   end
   return arr
end

data = myRand(2001,10^6)
sum(data)/length(data) #arithmetic mean
mean(data),var(data),1/12 #theor variance
minimum(data),maximum(data)
numBins = 200
plt[:hist](data,numBins);
```



The variance of a dataset is $\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}$

The variance of a uniform $[0, 1]$ random variable.... $\int_0^1 (x - \frac{1}{2})^2\, dx = \frac{1}{12}$

The Central Limit Theorem: Given a sequence of (i.i.d.) random variables $X_1, X_2, \ldots$. Take $S_n = \sum_{i=1}^{n} X_i$. Then $\frac{S_n - E[S_n]}{\sqrt{Var(S_n)}}$ approaches a standard normal distribution.

$$f(x) = \frac{1}{\sqrt{2\pi}} e^{-x^2/2}$$

In [ ]:

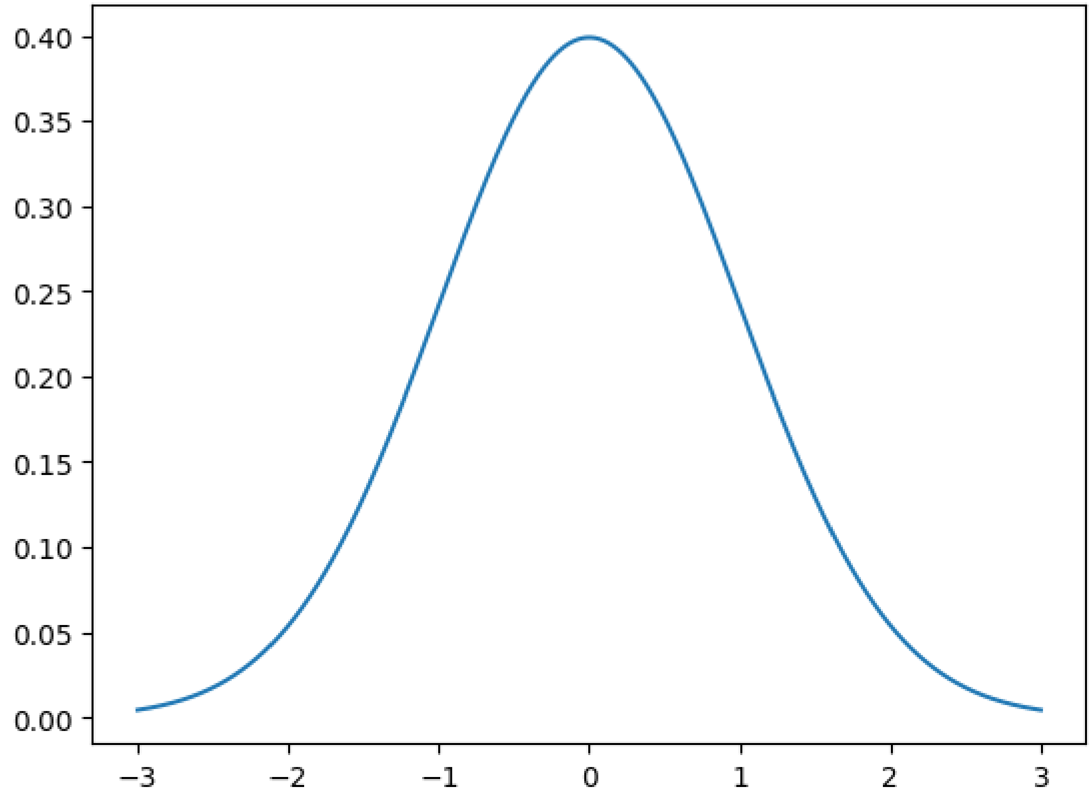
```

```

In [85]:

```

```



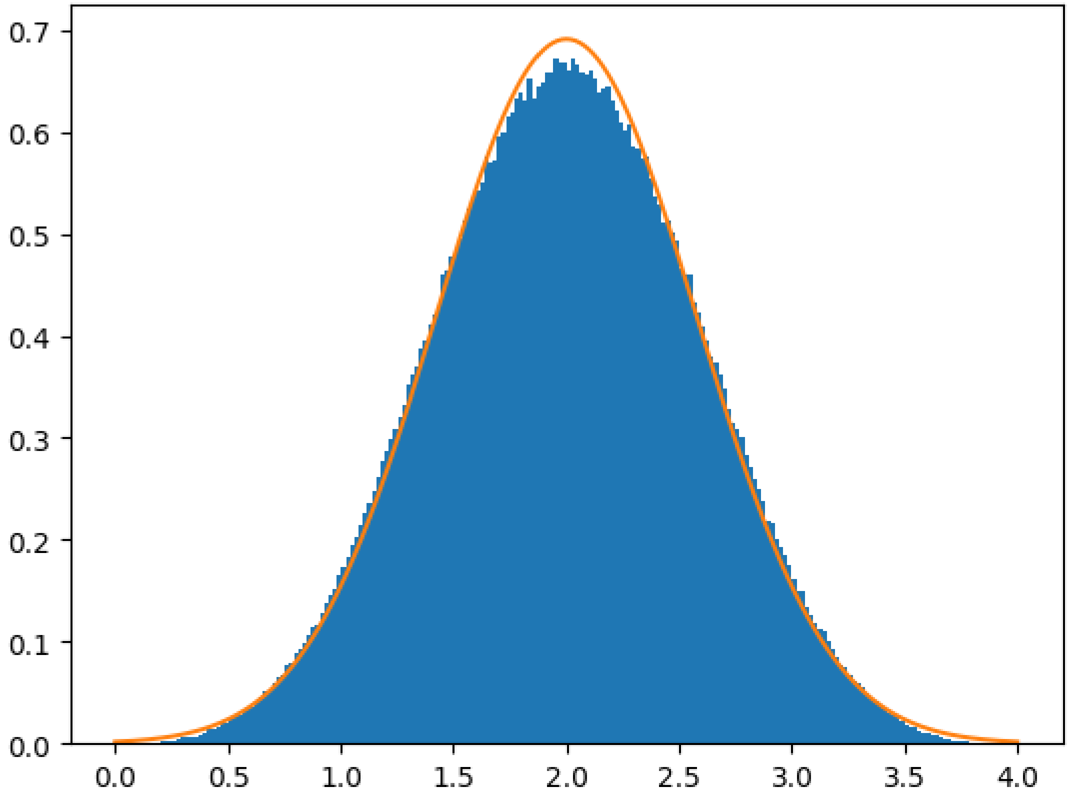
Out[85]:

```
1-element Array{PyCall.PyObject,1}:
 PyObject <matplotlib.lines.Line2D object at 0x7fcb874e6e50>
```

In [93]:

```
seed1, seed2, seed3, seed4 = 1957, 2008, 6454, 3423
n = 10^6
numBins = 200
data1 = myRand(seed1,n)
data2 = myRand(seed2,n)
data3 = myRand(seed3,n)
data4 = myRand(seed4,n)
plt[:hist]( data1 + data2 + data3 + data4,numBins,normed=true);

f(x) = (1/sqrt(2pi))*exp(-x^2/2)
g(x,mu,sig) = f((x-mu)/sig)*(1/sig)
xGrid = 0:0.01:4.0
yVals = [g(x,2,sqrt(4/12)) for x in xGrid]
plot(xGrid,yVals)
```



Out[93]:

```
1-element Array{PyCall.PyObject,1}:
 PyObject <matplotlib.lines.Line2D object at 0x7fcb85fab810>
```

In [56]:

```
? mean
```

```
search: mean mean! median median! PKGMODE_MANIFEST SegmentationFault m
acroexpand
```

Out[56]:

```
mean(itr)
```

Compute the mean of all elements in a collection.

> **Note**
>
> If itr contains NaN or missing values, the result is also NaN or missing (missing takes precedence if array contains both). Use th
e
> skipmissing function to omit missing entries and compute the mean of non-missing values.

Examples
==========

```
julia> mean(1:20)
10.5

julia> mean([1, missing, 3])
missing

julia> mean(skipmissing([1, missing, 3]))
2.0
```

```
mean(f::Function, itr)
```

Apply the function f to each element of collection itr and take the
mean.

```
julia> mean(√, [1, 2, 3])
1.3820881233139908

julia> mean([√1, √2, √3])
1.3820881233139908
```

```
mean(A::AbstractArray; dims)
```

Compute the mean of an array over the given dimensions.

Examples
==========

```
julia> A = [1 2; 3 4]
```

```
2×2 Array{Int64,2}:
 1  2
 3  4

julia> mean(A, dims=1)
1×2 Array{Float64,2}:
 2.0  3.0

julia> mean(A, dims=2)
2×1 Array{Float64,2}:
 1.5
 3.5
```

In [35]:

```
using Random
Random.seed!(200113)
rand(),rand(),rand()
```

Out[35]:

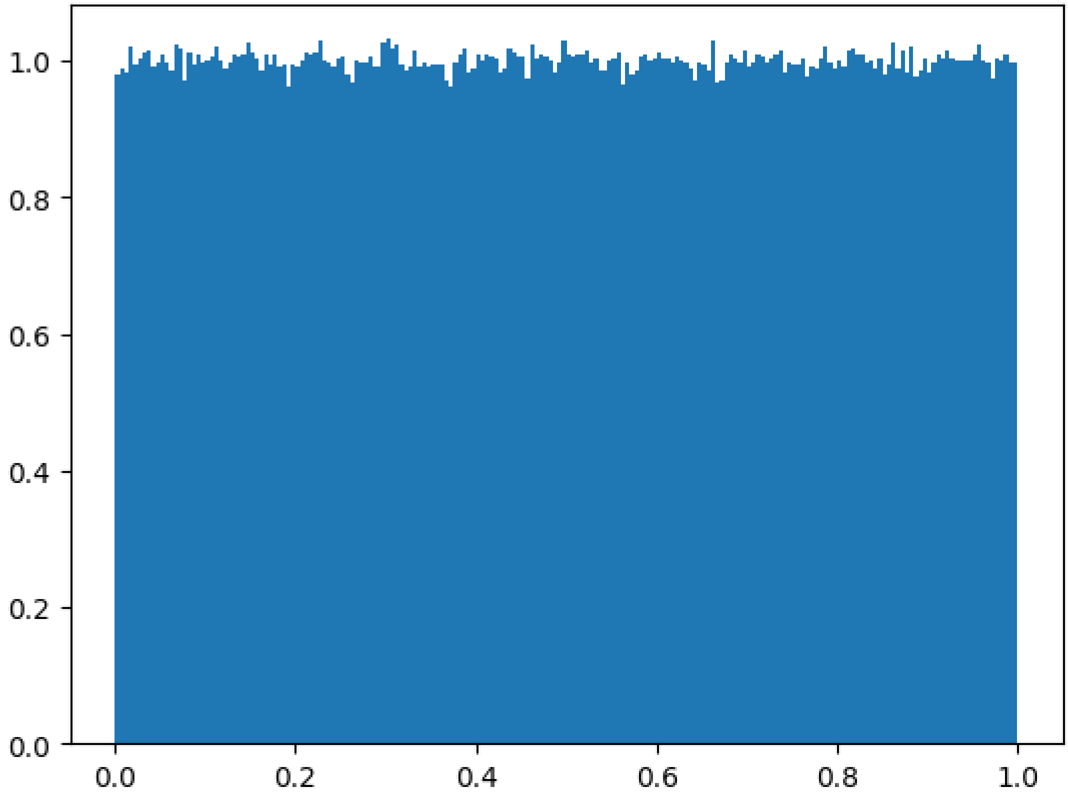
```
(0.31106965697333, 0.5688009013440853, 0.17119799533255797)
```

In [ ]:

In [ ]:

In [52]:

```
using PyPlot, Statistics
n = 1
plt[:hist]([mean(rand(n)) for _ in 1:10^6],200,normed=true);
```



In [ ]: