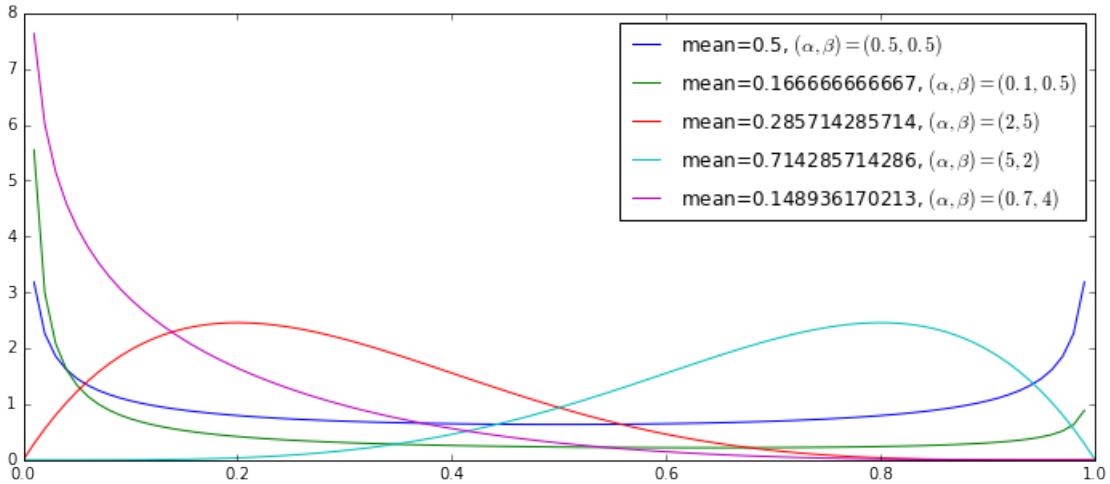
7.2

25 апреля 2016 г.

1 Задача 2

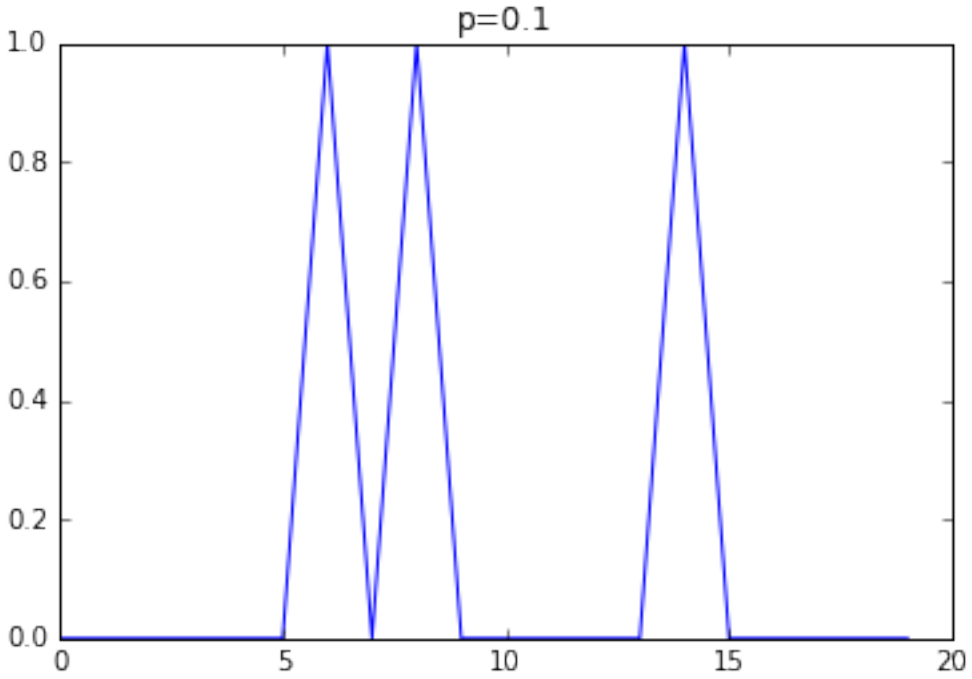
In [52]:
```
%matplotlib inline
import numpy as np
import math as mt
import matplotlib
import matplotlib.pyplot as plt
from pylab import *
from scipy.stats import *
```

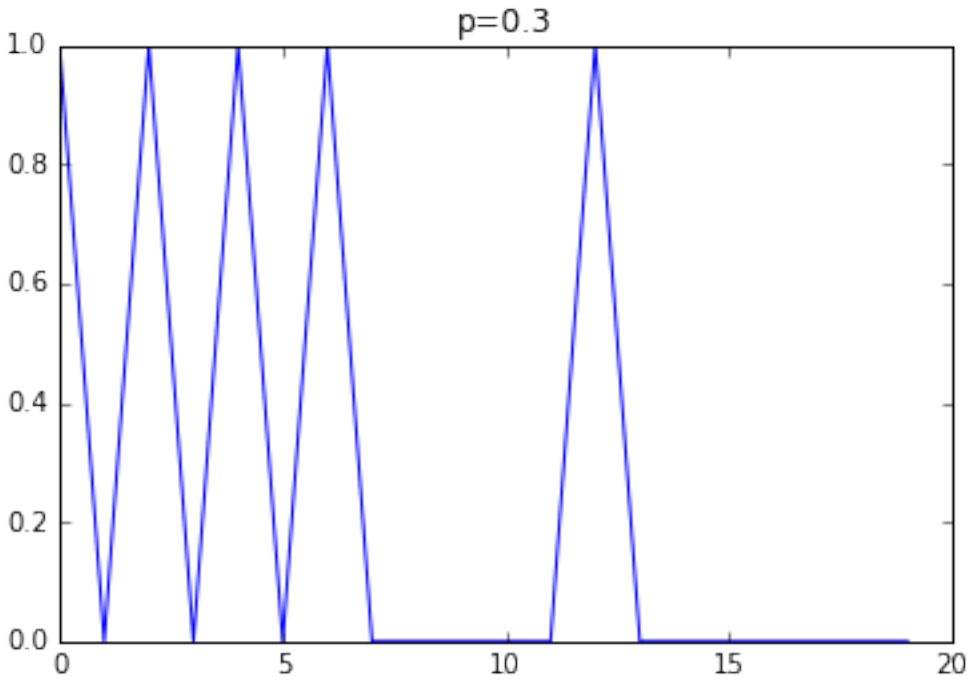
In [81]:
```
my_pr = [(0.5,0.5), (0.1,0.5), (2,5), (5,2), (0.7,4)]
plt.figure(figsize=(12,5))
for pp in my_pr:
    x = linspace(0,1,100)
    plt.plot(x, beta.pdf(x,a=pp[0],b=pp[1]), \
             label='mean={}, $(\\alpha,\\beta)=({},{})$'.format(pp[0]/float((pp[0]+pp[1])), pp[0], pp[1]))
    plt.legend()
plt.show()
```

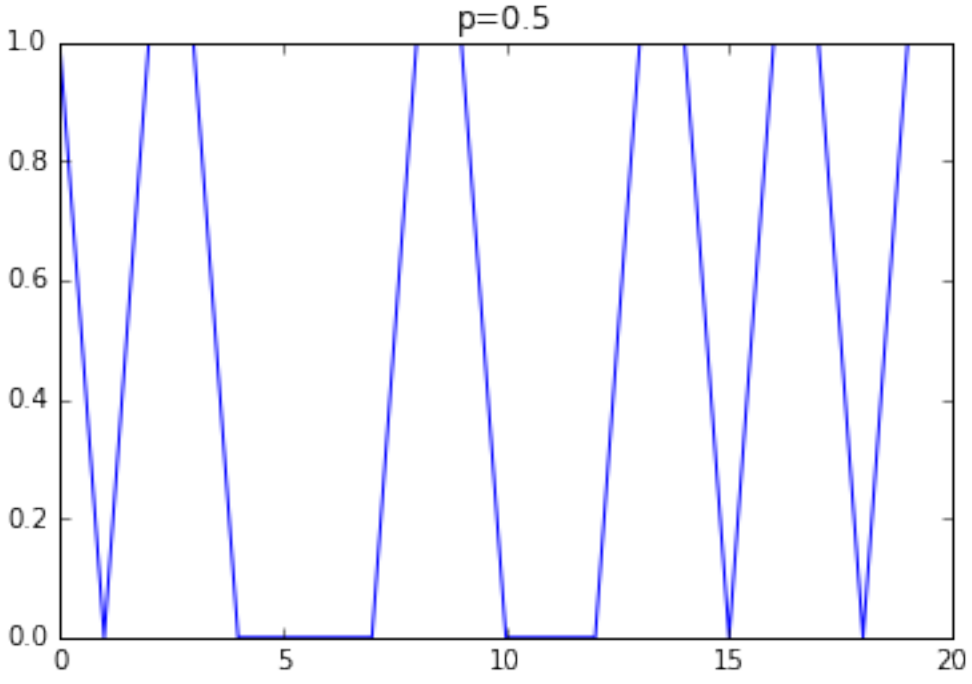


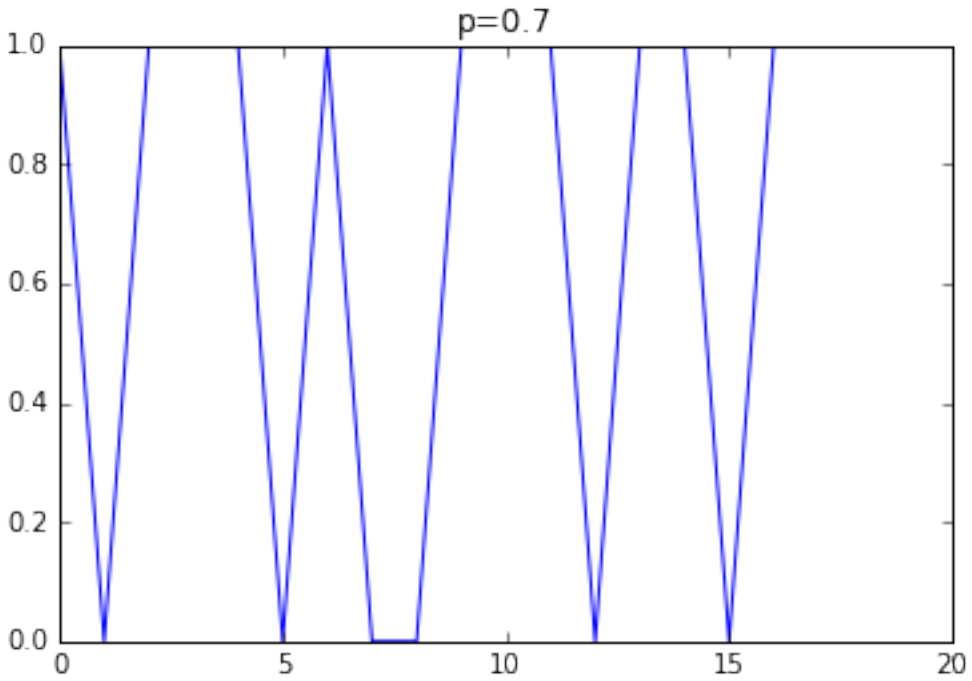
In [85]:
```
my_p = [0.1, 0.3, 0.5, 0.7, 0.9]
assert len(my_p)==len(my_pr), "Длины не совпадают"
```

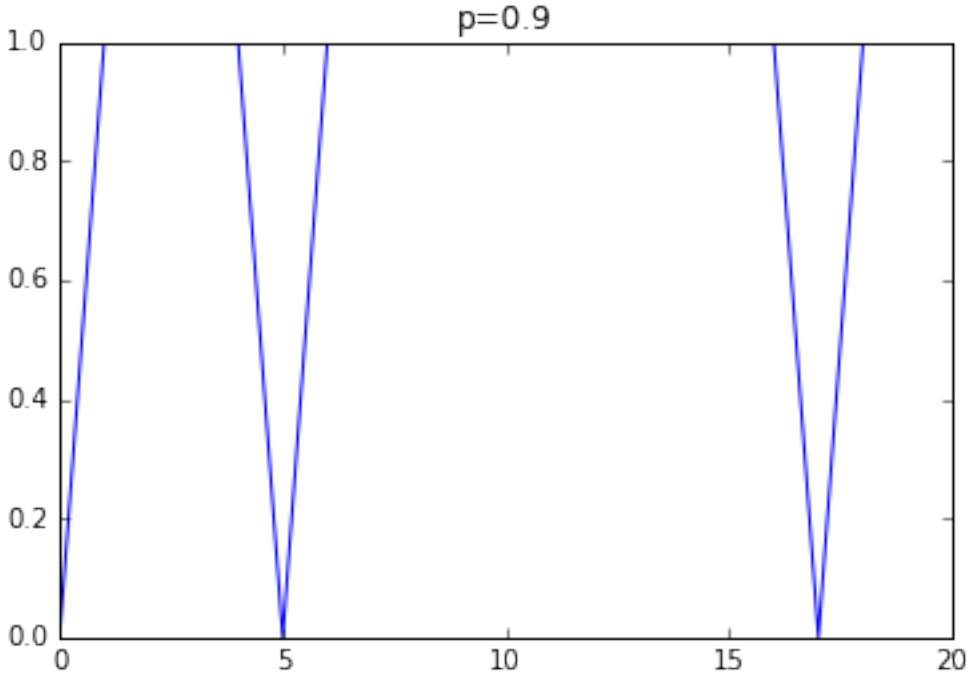
```
num = 20
x = np.zeros((len(my_p), num))
for i in range(len(my_p)):
    x[i] = binom.rvs(n=1, p=my_p[i], size=num)

it = 0
for i in x:
    figure()
    plot(i)
    title('p={}'.format(my_p[it]))
    it += 1
    show()
```




p=0.3
1.0
0.8
0.6
0.4
0.2
0.0
0
5
10
15
20

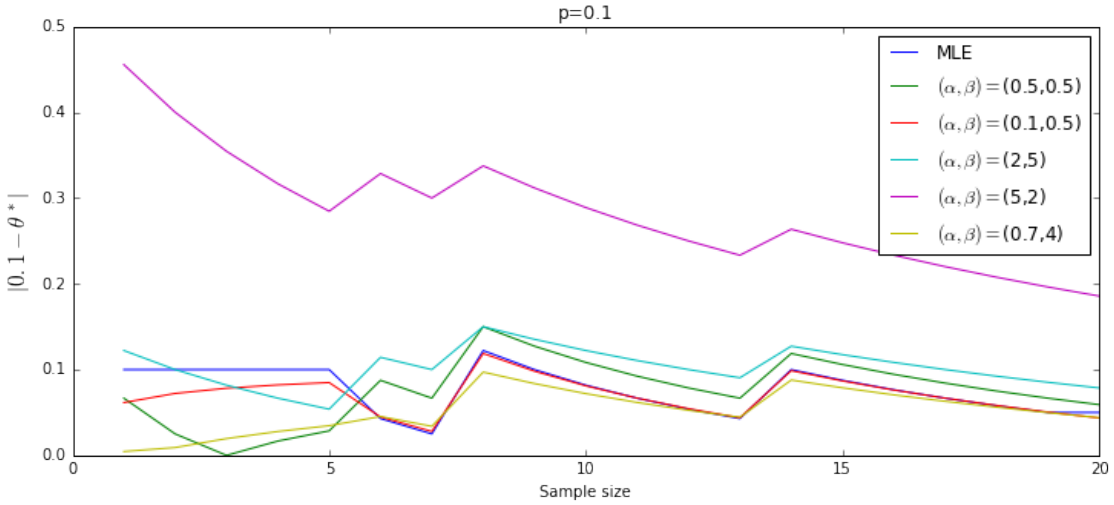

p=0.5
1.0
0.8
0.6
0.4
0.2
0.0
0
5
10
15
20

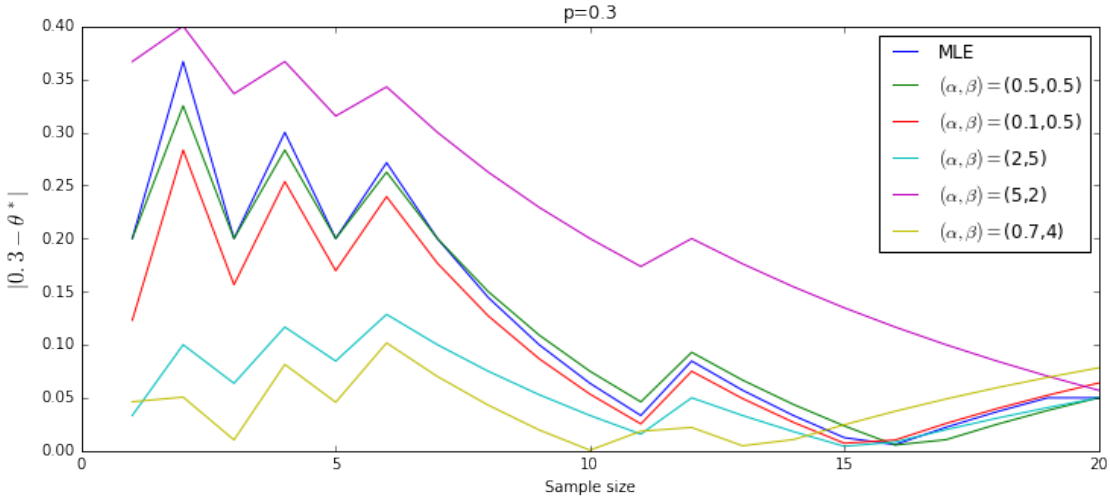


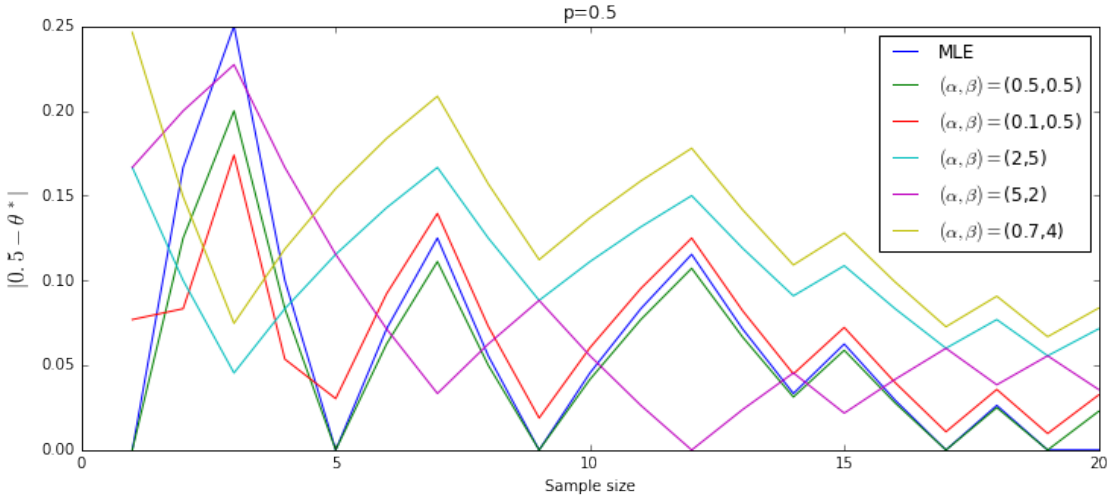


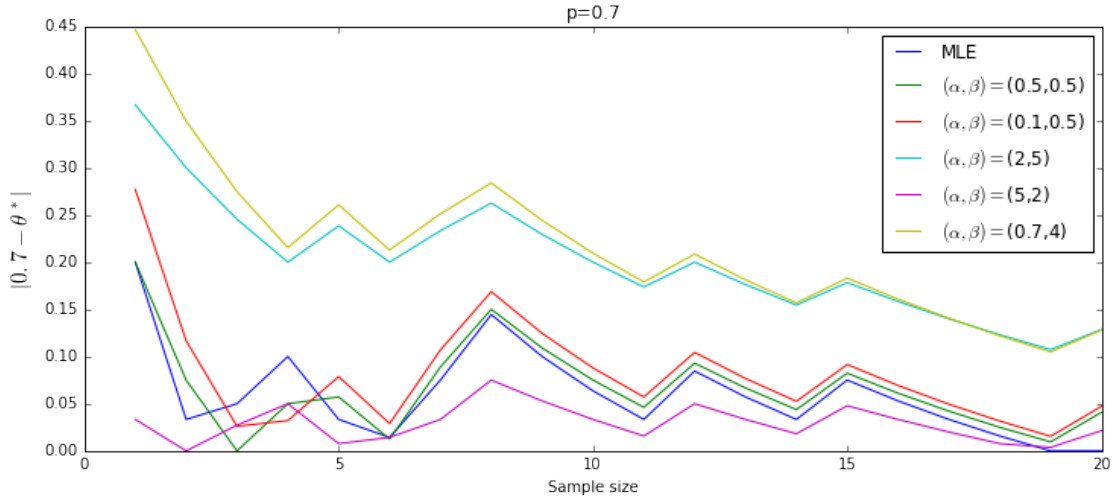
Математическое ожидания у распределения
$Beta(\alpha, \beta)$: mean=$\frac{\alpha}{\alpha+\beta}$. $\alpha = \alpha_0 + \sum_{i=1}^{n} x_i$, $\beta = \beta_0 + n - \sum_{i=1}^{n} x_i$. Следовательно, $\theta^* = \frac{\alpha_0+\sum_{i=1}^{n} x_i}{\alpha_0+\beta_0+n}$.

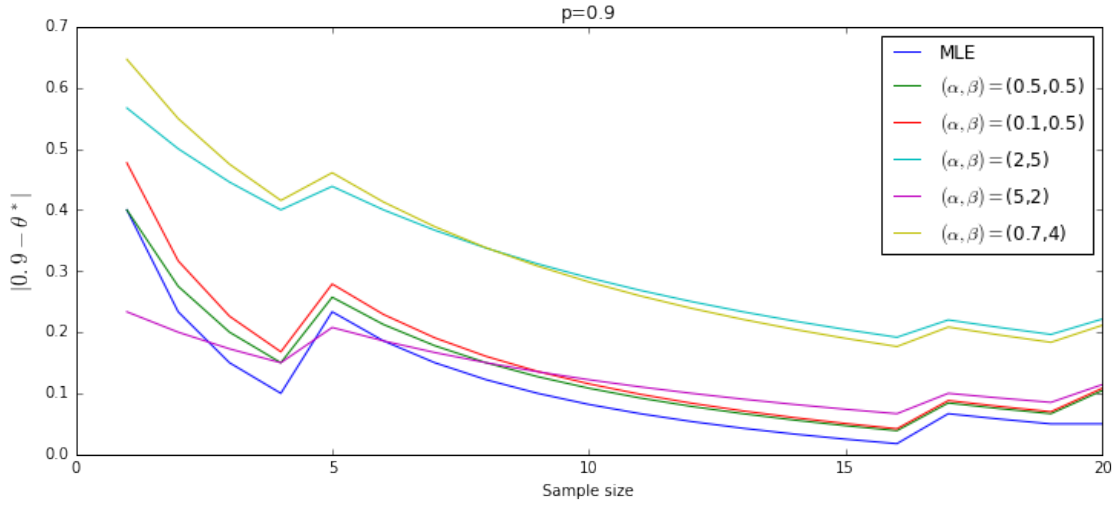
In [86]:
```
sz = len(my_p)
per = sz
est = np.zeros((sz,per,num))
mle = np.zeros((sz,num))
for i in range(sz):
    for k in range(per):
        est[i][k] = [float(my_pr[k][0] + sum(x[i][:(j+1)]))/float(my_pr[k][0] + my_pr[k][1] + j+1)\
                for j in range(1,num+1)]
    mle[i] = [mean(x[i][:(j+1)]) for j in range(1,num+1)]

for i in range(sz):
    figure(figsize=(12,5))
    plot(np.arange(1,num+1),abs(my_p[i]-mle[i]), label='MLE')
    for j in range(per):
        xlabel('Sample size')
        ylabel('$|{} - \\theta^*|$'.format(my_p[i]), fontsize=15)
        title('p={}'.format(my_p[i]))
        plot(np.arange(1,num+1),abs(my_p[i]-est[i][j]),\
            label='$(\\alpha,\\beta)=${},{})'.format(my_pr[j][0], my_pr[j][1]))
    legend()
    show()
```




p=0.3
MLE
$(\alpha,\beta)=(0.5,0.5)$
$(\alpha,\beta)=(0.1,0.5)$
$(\alpha,\beta)=(2,5)$
$(\alpha,\beta)=(5,2)$
$(\alpha,\beta)=(0.7,4)$
$|0.3-\theta^*|$
Sample size


p=0.5
MLE
$(\alpha,\beta)=(0.5,0.5)$
$(\alpha,\beta)=(0.1,0.5)$
$(\alpha,\beta)=(2,5)$
$(\alpha,\beta)=(5,2)$
$(\alpha,\beta)=(0.7,4)$
$|0.5-\theta^*|$
Sample size


p=0.7
MLE
$(\alpha,\beta)=(0.5,0.5)$
$(\alpha,\beta)=(0.1,0.5)$
$(\alpha,\beta)=(2,5)$
$(\alpha,\beta)=(5,2)$
$(\alpha,\beta)=(0.7,4)$
$|0.7-\theta^*|$
Sample size


p=0.9
MLE
$(\alpha,\beta)=(0.5,0.5)$
$(\alpha,\beta)=(0.1,0.5)$
$(\alpha,\beta)=(2,5)$
$(\alpha,\beta)=(5,2)$
$(\alpha,\beta)=(0.7,4)$
$|0.9-\theta^*|$
Sample size

In [ ]:

In [ ]:

In [ ]: