NAME:_____

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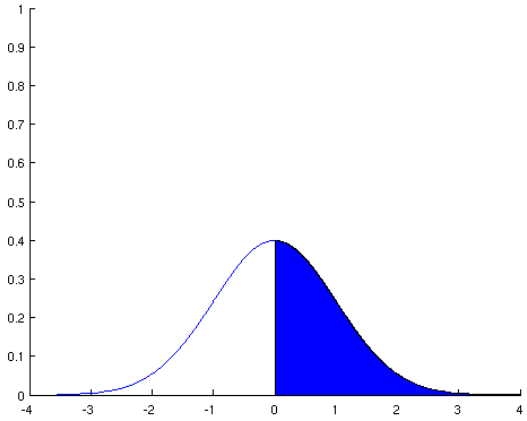
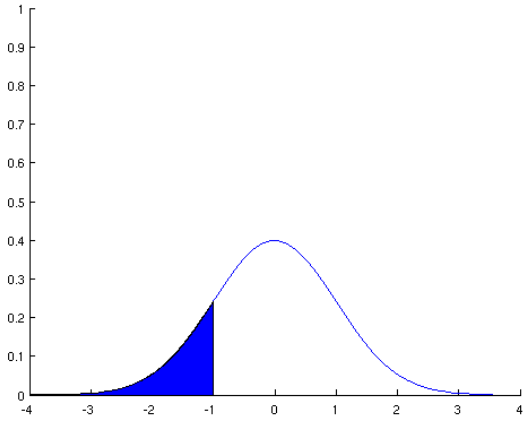
Theorem Checbyshev's theorem states that given a collection of data values, then for any number $k > 1$, the proportion of these data values that fall within k standard deviations of the mean is at least $1 - 1/k^2$

1. What is the probability of a standard normal random variable of assuming a value greater than μ?



_____

2. What is the probability for a normal random variable to assume a value smaller than $\mu - \sigma$?



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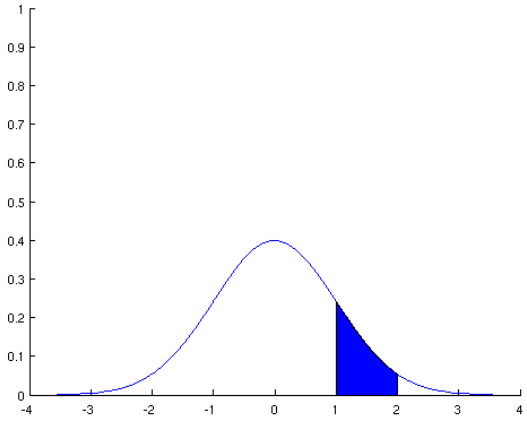
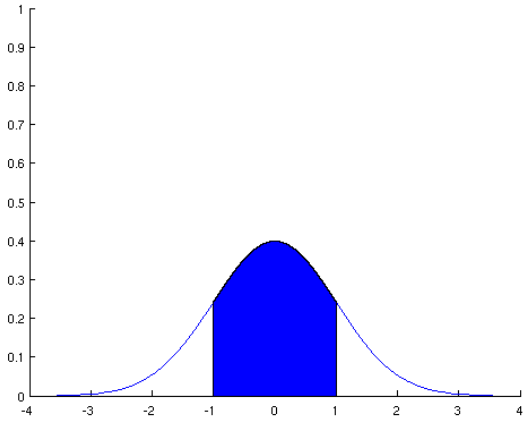
3. What is the probability for a normal random variable to assume a value in between $\mu+\sigma$ and $\mu+2\sigma$?



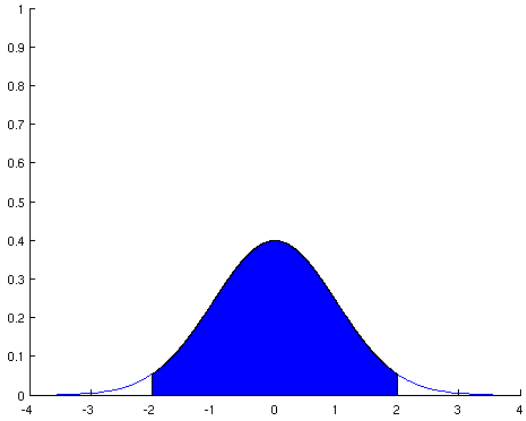
4. According to Chebyshev theorem, what is the minimum probability for a random variable to assume a value in between $\mu-\sigma$ and $\mu+\sigma$?

5. What is the probability for a normal random variable to assume a value in between $\mu-\sigma$ and $\mu+\sigma$?



6. According to Chebyshev theorem, what is the minimum probability for a random variable to assume a value in between $\mu-2\sigma$ and $\mu+2\sigma$?

7. What is the probability for a normal random variable to assume a value in between $\mu - 2\sigma$ and $\mu + 2\sigma$?



_____

8. What is the percentage of values that fall outside 3 standard deviations of the mean for a normal random variable?

_____

_____

9. What is the percentage of values that fall outside 4 standard deviations of the mean for a normal random variable?

_____

_____

Definition The standard normal random variable is the normal random variable with mean $\mu = 0$ and standard deviation $\sigma = 1$. Its values are usually represented by the symbol z. The area under the standard normal curve to the right of the value α, is denoted with z_α.

10. Compute the following values:
    (a) $z_{1\%} =$ _____
    (b) $z_{2.5\%} =$ _____
    (c) $z_{5\%} =$ _____
    (d) $z_{25\%} =$ _____
    (e) $z_{50\%} =$ _____
    (f) $z_{75\%} =$ _____
    (g) $z_{95\%} =$ _____
    (h) $z_{97.5\%} =$ _____
    (i) $z_{99\%} =$ _____

Find out how the commands binopdf, binocdf, and binoinv work in matlab and then answer the following questions (show the code used):

11. What is the probability that playing red on the roulette 1083 times you win less than or equal to 494 times?

12. What is the mean and standard deviation of the binomial distribution with parameters $n = 1083$, $p = 18/38$, $q = 1 - p = 20/38$?

13. What is the probability that a normal random variable, with parameters μ and σ as before, assumes a value smaller than or equal to 494.5?

14. Describe the following code and run it

```
%% Binomial distribution vs normal distribution
n = 100;
p = 1/2;
q = 1-p;
mu = p*n;
sigma = sqrt(n*p*q);

X1 = round(mu-2*sigma):round(mu+2*sigma);
bar(X1,binopdf(X1,n,p));
hold on;
X2 = round(mu-2*sigma):.1:round(mu+2*sigma);
plot(X2,normpdf(X2,mu,sigma),'Color','red','Linewidth',2);
hold off;
```

15. What conclusions can you draw?