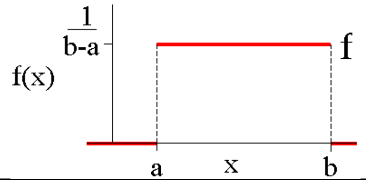
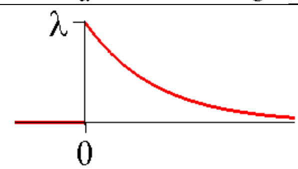
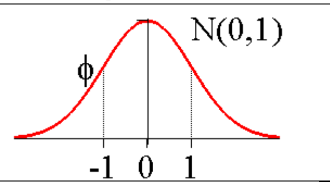
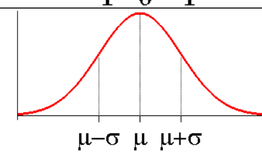
Study aid 3: Frequently used continuous distributions with their characteristics:

Name + parameter(s)	Density function	Sketch of the graph	$E(X)$	$var(X)$	An application
Uniform $U(a,b)$	$f(x) =$		$\frac{a+b}{2}$	$\frac{(b-a)^2}{12}$	
Exponential $Exp(\lambda)$	$f(x) =$		$\frac{1}{\lambda}$	$\frac{1}{\lambda^2}$	
Standard normal $N(0,1)$	$\varphi(z) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}z^2}$				
Normal $N(\mu,\sigma^2)$	$f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$				

Relations between distributions:

Distribution of X	(approximate) distribution	Rule of thumb in case of approximation
Hypergeometric R, N, n	**Binomial**	
Binomial $B(n,p)$	**Poisson**	
	Normal	
Normal $X \sim N(\mu,\sigma^2)$	$Y = aX + b \sim$	
Normal $X \sim N(\mu_1,\ \sigma_1^2)$, $Y \sim N(\mu_2,\sigma_2^2)$, X and Y ind.	$X + Y \sim$	
Not-normal $X_1, \ldots, X_n$ are independent and identically distributed with expectation μ and variance σ^2	$\sum_{i=1}^{n} X_i \sim$	

Study aid 3: Frequently used continuous distributions with their characteristics:

Name + parameter(s)	Density function	Sketch of the graph	$E(X)$	$var(X)$	An application
Uniform $U(a,b)$	$\boldsymbol{f(x) = \frac{1}{b-a}}$, if $\boldsymbol{a \le x \le b}$		$\frac{a+b}{2}$	$\frac{(b-a)^2}{12}$	$X =$ "random number between 0 and 1" $X \sim U(0,1)$
Exponential $Exp(\lambda)$	$\boldsymbol{f(x) = \lambda e^{-\lambda x}}$, **for** $\boldsymbol{x \ge 0}$		$\frac{1}{\lambda}$	$\frac{1}{\lambda^2}$	$X =$ "interarrival time between two consecutive customers" $E(X) = \frac{1}{\lambda}$
Standard normal $N(0,1)$	$\boldsymbol{\varphi(z) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}z^2}}$		**0**	**1**	$X =$ "error for measurements with standard deviation 1" $X \sim N(0,1)$
Normal $N(\mu,\sigma^2)$	$\boldsymbol{f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}}$		$\boldsymbol{\mu}$	$\boldsymbol{\sigma^2}$	$X =$ "IQ of an arbitrary student" $X \sim N(\mu,\sigma^2)$

Relations between distributions:

Distribution of X	(approximate) distribution	Rule of thumb in case of approximation
Hypergeometric R, N, n	**Binomial** $B\left(n,\frac{R}{N}\right)$	$N > 5n^2$
Binomial $B(n,p)$	**Poisson** $\boldsymbol{\mu = np}$	$n \ge 25$ and $np < 10$ or $n(1-p) < 10$
	Normal $\boldsymbol{N(np, np(1-p)}$	$n \ge 25$ and $np > 5$ and $n(1-p) > 5$
Normal $X \sim N(\mu,\sigma^2$	**Normal** $Y = aX + b \sim N(a\mu + b, a^2\sigma^2)$	--
Normal $X \sim N(\mu_1, \sigma_1^2)$, $Y \sim N(\mu_2, \sigma_2^2)$, X and Y ind.	**Normal**: $X + Y \sim N(\mu_1 + \mu_2, \sigma_1^2 + \sigma_2^2)$,	--
Not-normal $X_1, \dots, X_n$ are independent and identically distributed with expectation μ and variance σ^2	$\boldsymbol{\sum_{i=1}^{n} X_i} \overset{\text{CLT}}{\sim} \boldsymbol{N(n\mu, n\sigma^2)}$	$n \ge 25$