

Κανονική Κατανομή / Κατανομή Gauss

(1)

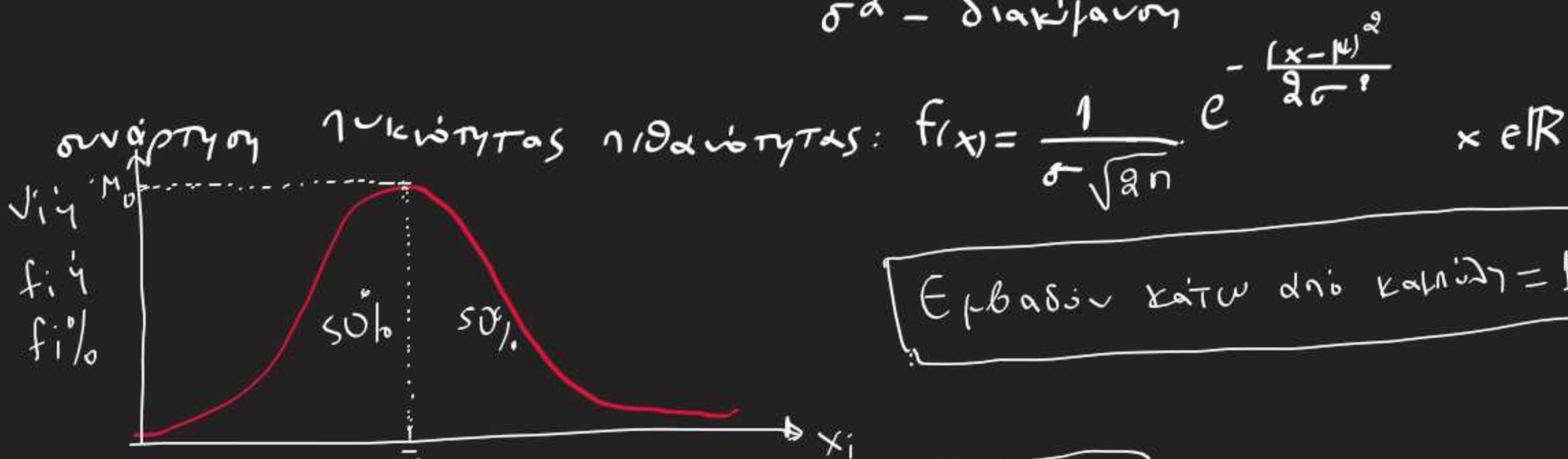
Γαλλική Normal

συμβολίζεται: $X \sim N(\mu, \sigma^2)$

έχει δύο παραμέτρους: μ - μέση

σ - τυπική απόκλιση $\frac{1}{\sigma}$ (με $\sigma > 0$)

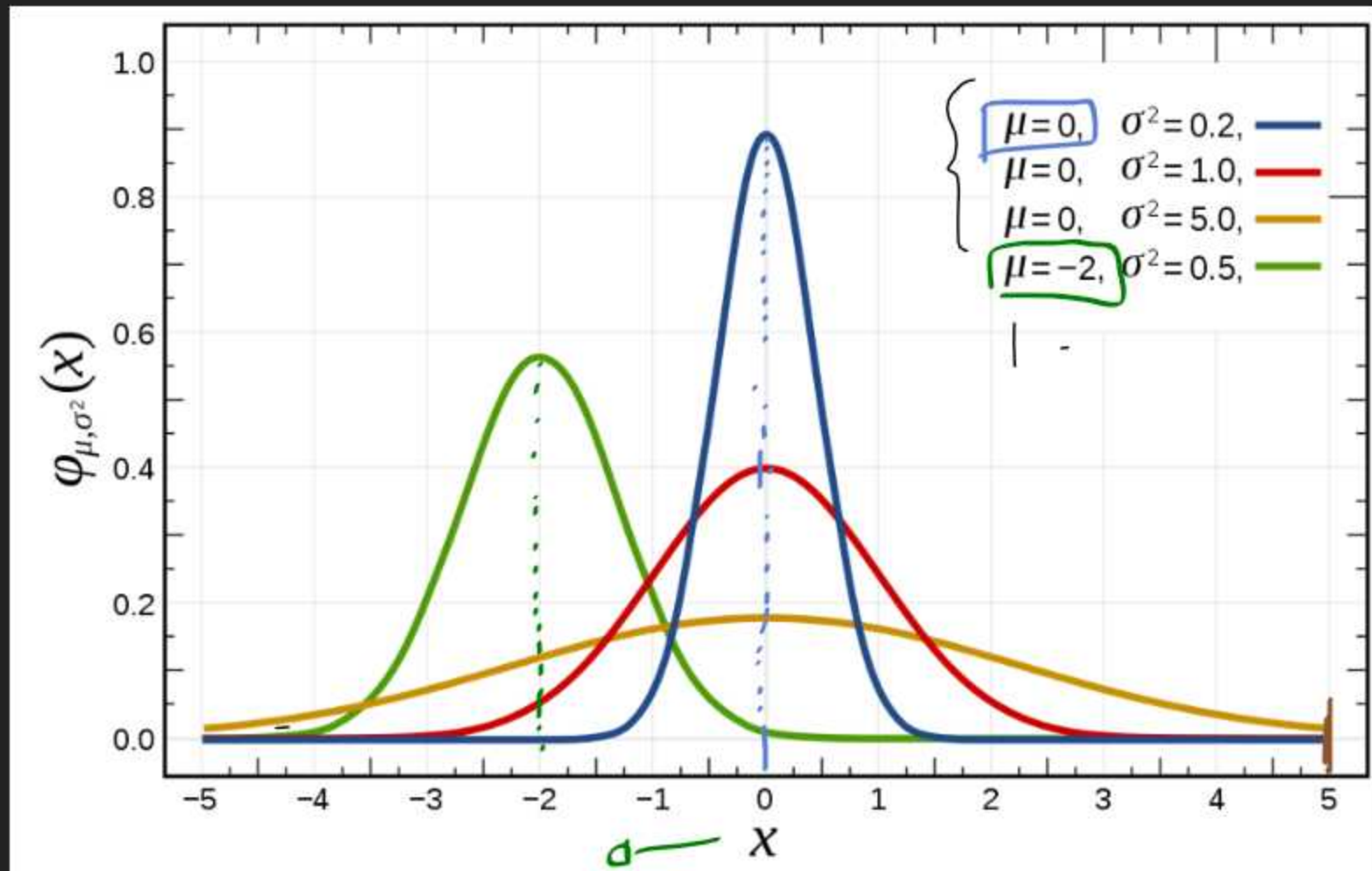
σ^2 - διακύμανση



Εμβαδόν κάτω από καμπύλη = 1

Μεση τ.μ. = Διαμεσός = Επικρατούσα Τιμή

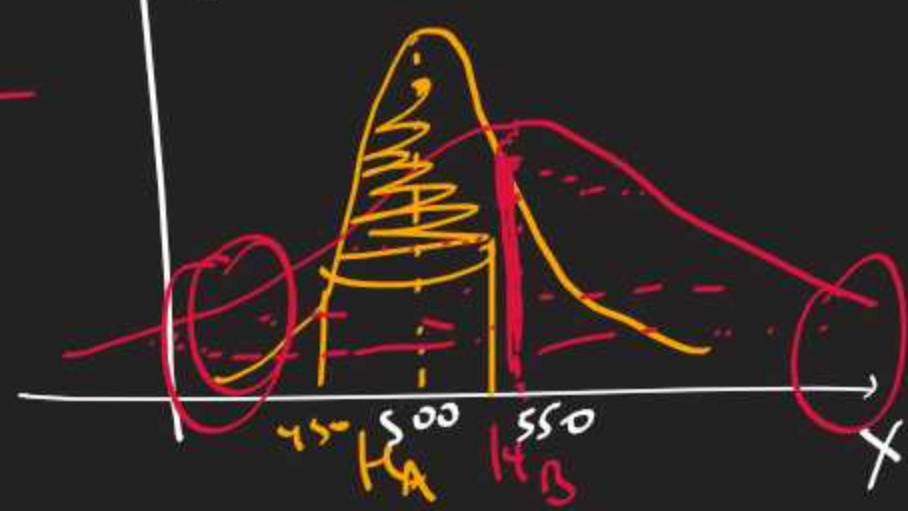
κανονικές κατανομές με διάφορες τιμές των μ, σ^2



πρακτικά:

$\mu \leftrightarrow$
 $\sigma \downarrow \sigma^2 \uparrow$

Λίναστα Α — $f_i\%$
Λίναστα Β —



X (βάρος φυγών ουσίας)

Τυπική κανονική κατανομή

Συνεχής

$$X \sim N(0, 1)$$

$$\mu = 0 \quad \text{και} \quad \sigma = 1 \quad (\Rightarrow \sigma^2 = 1)$$

$$\phi(z) = P(Z \leq z) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^z e^{-\frac{u^2}{2}} du$$

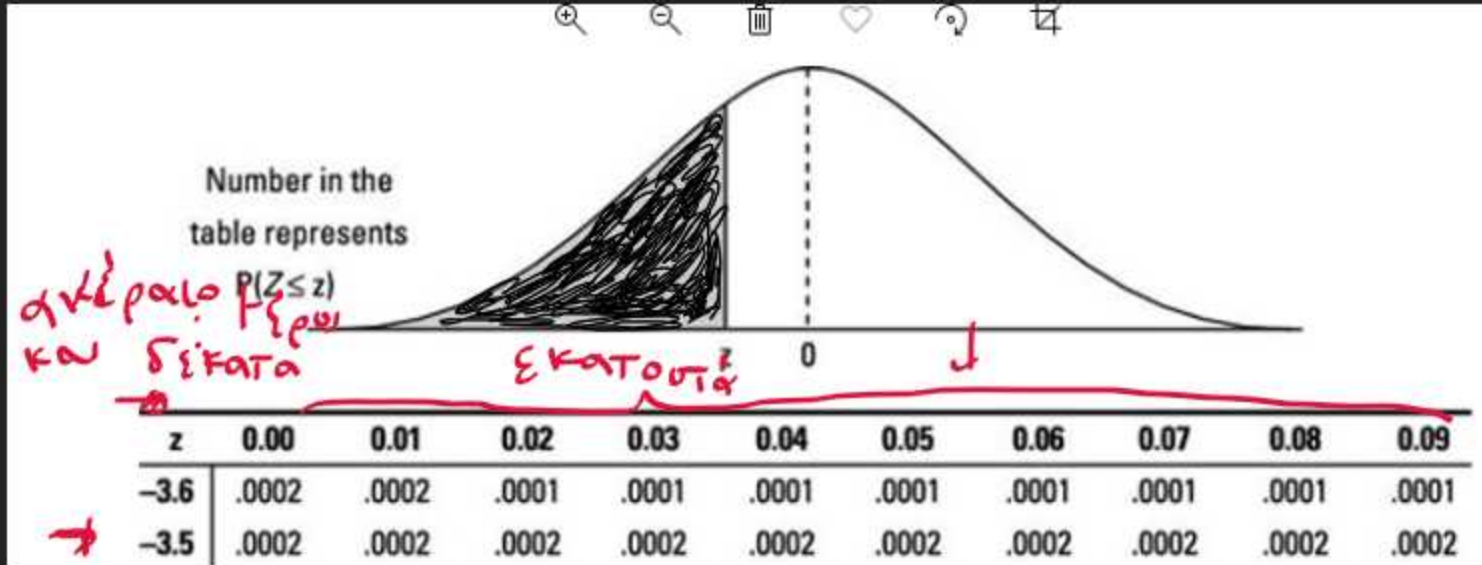
μεταβλητή αριθμός

Διακριτή Μεταβλητή (2)

Poisson ή Διωνυμική

$$P(X \leq 2) = P(X=0) + P(X=1) + P(X=2)$$

X - συνεχής μεταβλητή αριθμός



$$P(X < 1.70) = P(X=1.68) + P(X=1.69) + P(X=1.681) + P(X=1.6819) + P(X=1.68195783)$$

Ο πίνακας z-score μου δίνει την πιθανότητα η μεταβλητή Z να πάρει τιμές από $-\infty$ έως z.

δίνω θα έλεγε να προσθέσω όλους

δίνω ορισμένες τιμές

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.6	.0002	.0002	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
-3.5	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0002
-3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
-3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
-3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
-3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
-3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
-2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
-2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
-2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
-2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
-2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
-2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
-2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
-2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
-2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
-2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
-1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
-1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
-1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
-1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
-1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
-1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
-1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
-1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
-1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170

σε αυτή στήλη > 0.07

$$P(Z < -3.27) = 0.0005$$

σε αυτή στήλη 0.02

$$P(Z < -2.32) = 0.0102$$

σε αυτή στήλη 0.05

$$P(Z < -1.55) = 0.0606$$

$P(Z < -0,87) = \Phi(-0,87) = 0,1922$

$P(Z < 1,23) = \Phi(1,23) = 0,8907$

$P(Z < 0) = \Phi(0) = 0,500$

$P(Z = 1,38) = 0$

$P(Z = -0,96) = 0$

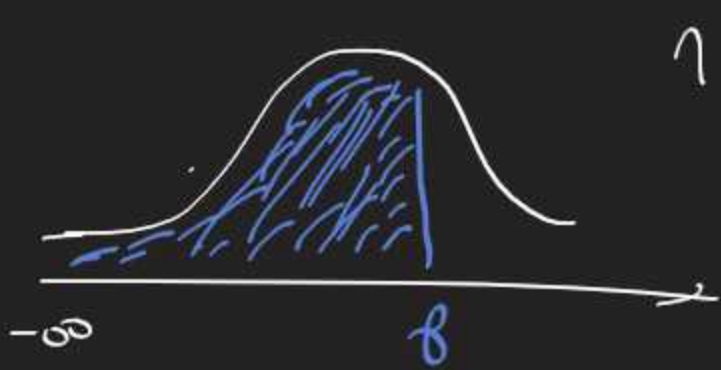
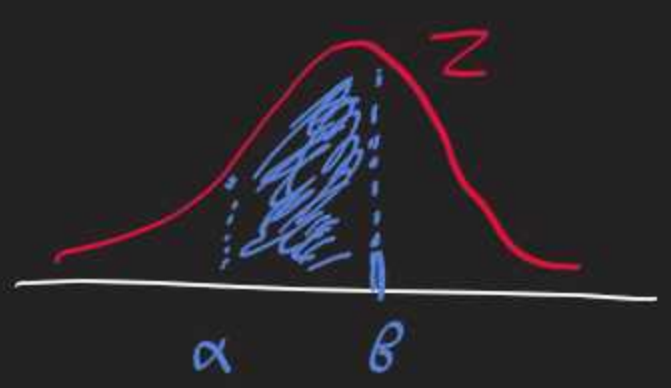
Λιθανώτητα για συνεχής μεταβλητή να πάρει ακριβώς μία τιμή είναι ΜΗΔΕΝ

$P(Z \leq 0,83) = P(Z < 0,83)$

δεν έχει διαφορά στις συνεχείς μεταβλητές

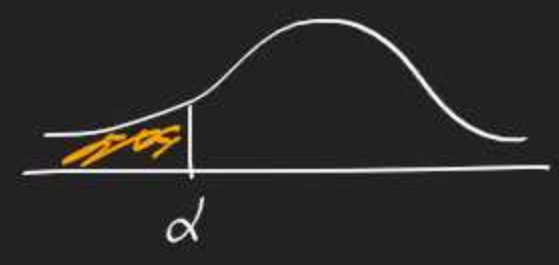
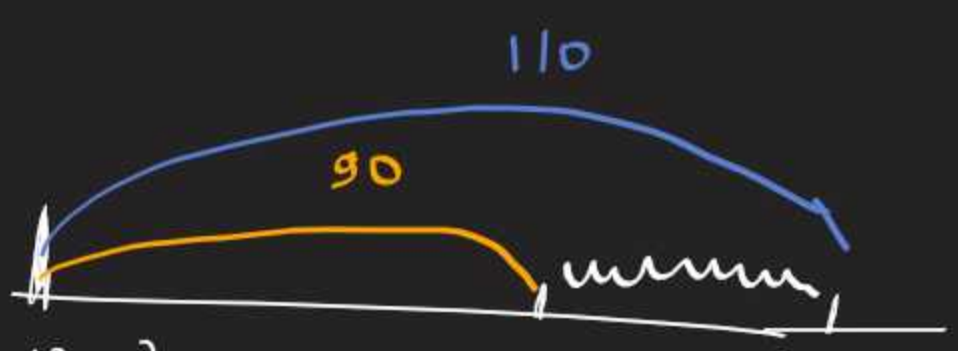
• $P(Z < \alpha) = \Phi(\alpha) \rightarrow$ αν β νινάκα z-score

• $P(\alpha < Z < \beta) = P(Z < \beta) - P(Z < \alpha) = \Phi(\beta) - \Phi(\alpha)$

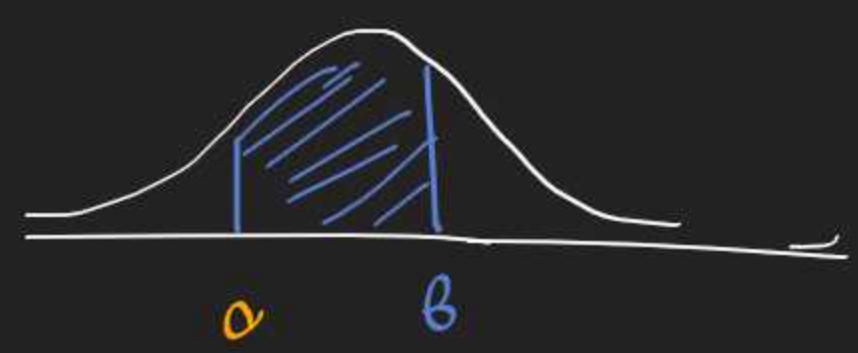


νινάκα

Σίγουρα



Αλυσή/110, Διαφορετικό οριστικό δα
-∞ α β



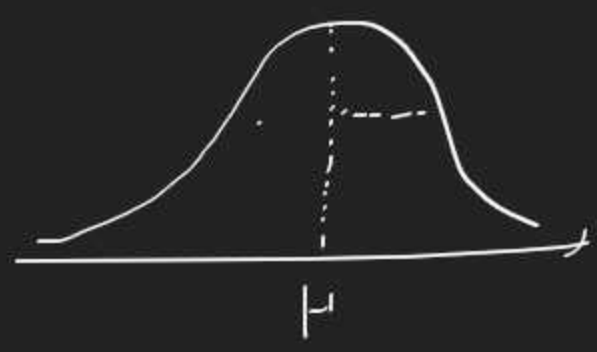
Διαφορετικό οριστικό δα: 110 - 90 = 20%

• $P(Z > \alpha) = 1 - P(Z < \alpha) = 1 - \Phi(\alpha)$

Μετασχηματισμός

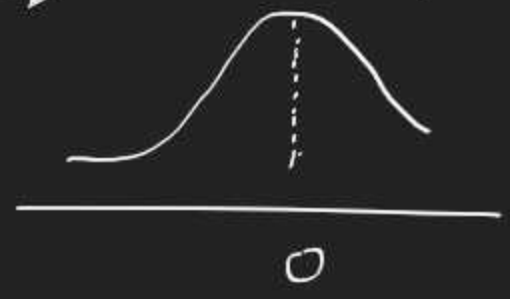
$$\frac{X - \mu}{\sigma} = Z$$

$X \sim N(\mu, \sigma^2)$



$\frac{X - \mu}{\sigma}$

$Z \sim N(0, 1)$



Τις X που ακολουθούν κανονική κατανομή

nx

Κανονική κατανομή με:

$\mu = 5$

$\sigma = 2$

X	$\frac{X - \mu}{\sigma}$	Z
2	$\frac{2 - 5}{2} = -1,5$	-1,5
3	$\frac{3 - 5}{2} = -1$	-1
3		-1
5	$\frac{5 - 5}{2} = 0$	0
5		0
5		0
5		0
6	$\frac{6 - 5}{2} = 0,5$	0,5
6		0,5
9	$\frac{9 - 5}{2} = 2$	2

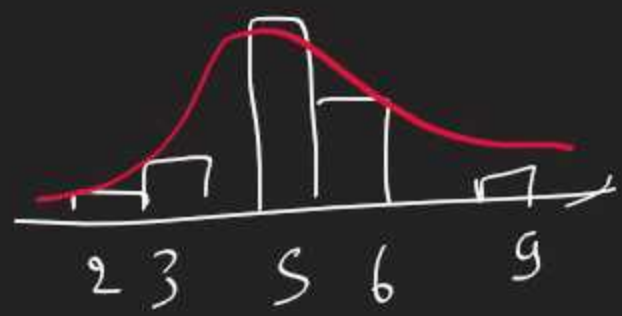
Τυπική Κανονική Κατανομή

$Z \sim N(0, 1)$

$\mu = 0$

$\sigma = 1$

Δώσε Χρησιμοποιήστε να εφευρέσετε!!

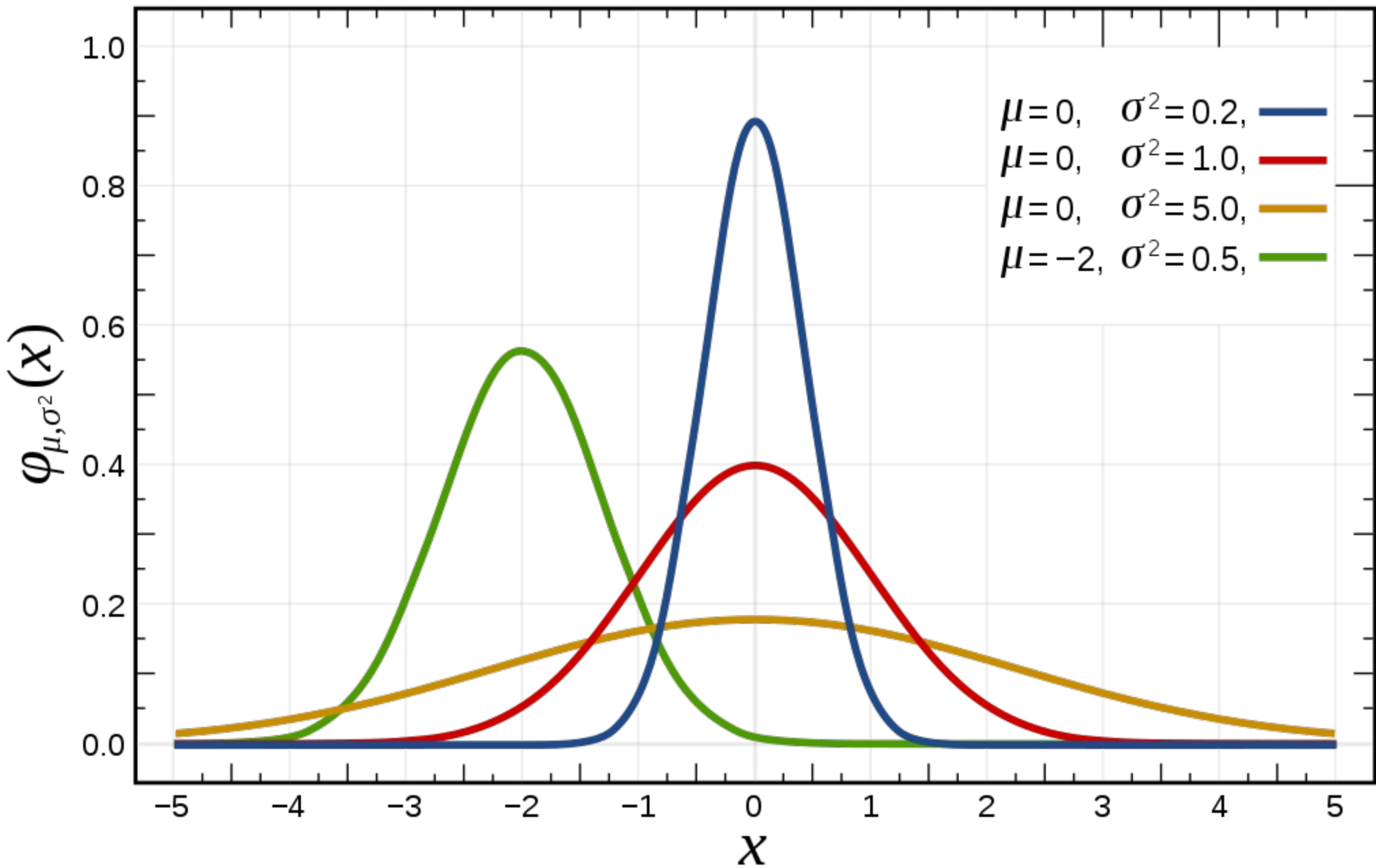


$$\frac{X - \mu}{\sigma} = Z$$

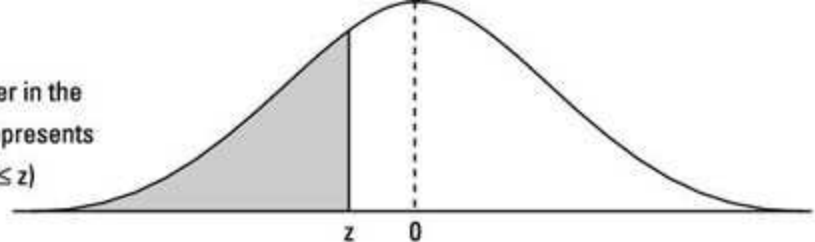
ουσιαστικά μπορεί να υπολογιστούν πιθανότητες για οποιαδήποτε κανονική κατανομή αναγράφονται την σελίδα Τυπική Κανονική Κατανομή Z και χρησιμοποιούμε z score table

Υψος $X \sim N(170, 5^2)$

$P(160 < X < 180)$



Number in the
table represents
 $P(Z \leq z)$



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.6	.0002	.0002	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
-3.5	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0002
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-3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
-3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
-3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
-3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
-2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
-2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
-2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
-2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
-2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
-2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
-2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
-2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
-2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
-2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
-1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
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-1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
-1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
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-1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
-1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
-1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
-0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
-0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
-0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
-0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
-0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
-0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
-0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
-0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
-0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
-0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641

