3/19/18 p1

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

$\mu = 0 \qquad \sigma = 1$

$$A = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{-\frac{x^2}{2}}\, dx$$

$$A = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{-\frac{y^2}{2}}\, dy$$

$$A^2 = \frac{1}{2\pi} \int_{-\infty}^{\infty}\int_{-\infty}^{\infty} e^{-\frac{x^2+y^2}{2}}\, dx\,dy$$

That's integrating over the whole plane. Change variables $\rho \quad \theta$

$x = \rho \cos \theta$

$y = \rho \sin \theta$

$$x^2+y^2=\rho^2$$

$$x=\rho\cos\theta$$

$$y=\rho\sin\theta$$

$$\frac{\partial x}{\partial\rho}=\cos\theta \qquad \frac{\partial x}{\partial\theta}=-\rho\sin\theta$$

$$\frac{\partial y}{\partial\rho}=\sin\theta \qquad \frac{\partial y}{\partial\theta}=\rho\cos\theta$$

$$J=\begin{vmatrix}\cos\theta & -\rho\sin\theta\\ \sin\theta & \rho\cos\theta\end{vmatrix}=\rho$$

$$dx\,dy=\rho\,d\rho\,d\theta$$

$$\frac{1}{2\pi}\int_{-\infty}^{\infty}\int_{-\infty}^{\infty}e^{-\frac{x^2+y^2}{2}}\,dx\,dy=\frac{1}{2\pi}\int_0^{\pi}\int_0^{\infty}e^{-\frac{\rho^2}{2}}\rho\,d\rho\,d\theta$$

$$\cancel{\int_0^{\infty}\rho e^{-\frac{\rho^2}{2}}d\rho=-e^{-}}$$

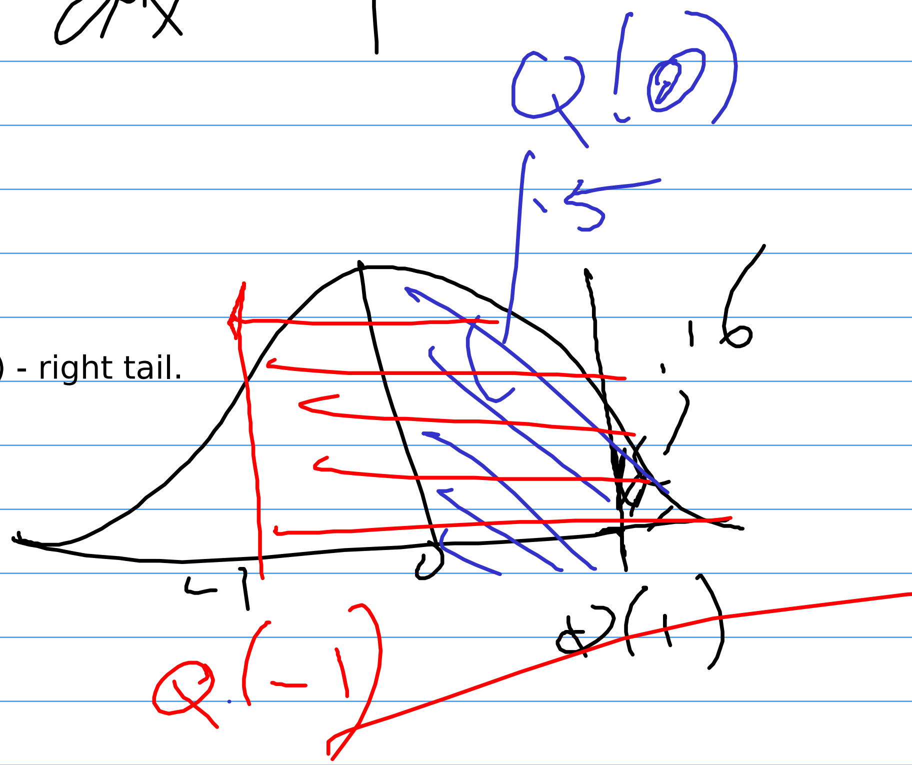
$$\int_0^\infty \rho\, e^{-\frac{\rho^2}{2}}\, d\rho$$

$$-e^{-\frac{\rho^2}{2}}\Big|_0^\infty$$

exponent: rho squared over two, minus

$$= 1$$

$$\frac{1}{\sqrt{2\pi}}\int_{-\infty}^{\infty} e^{-\frac{x^2}{2}}\,dx = 1$$

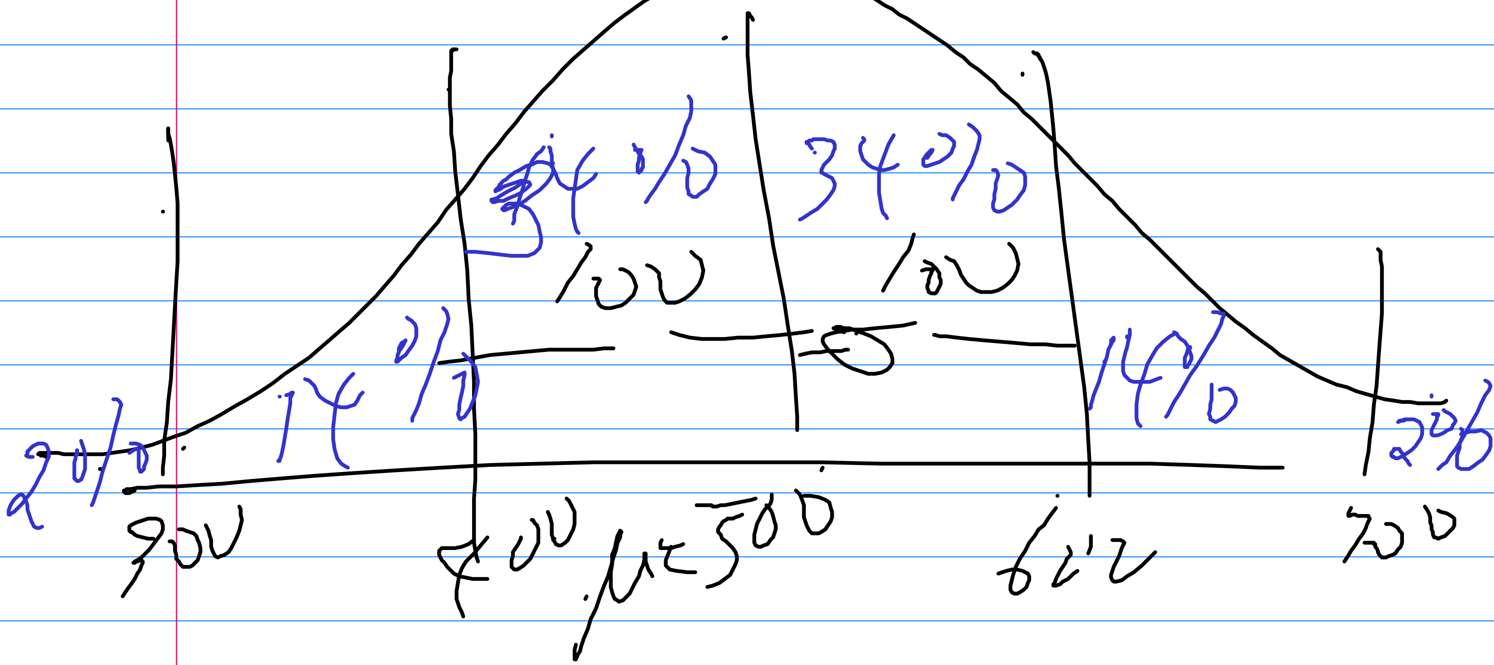


book page 168 has table of Q(x) - right tail.

how to find q(-1)? It's not in table. Integral from -inf to -1 = int from 1 to inf. = .16. Int from -1 to inf is 1- (int from -inf to -1) = 1= .16 = .84.

That table has m=0, s=1.

5



homework: book 4.85 on p 223.

I'll do a special case. x is N(0,10). y is N(100,100).

y=ax+b. What are a,b?
sigma scales by a, so a=10.
mean transforms to mean
100=10x+b b=100.
y=10x+100

example 2 transform SAT N(500,100) to standard N(0,1).

y=.01 x - 5 .

500-> 0. 600-> 1. 200 -> -3.

N(m,s) means normal dist with mean m and std s.

4.90

var=2 -> s= 1.4

do this for R=1.

y=x^2.

dy/dx = 2x

F(x) = prob(X<=x).

F(y) = prob(Y<=y) = prob(Y<x^2)

Example 5.5 p 253