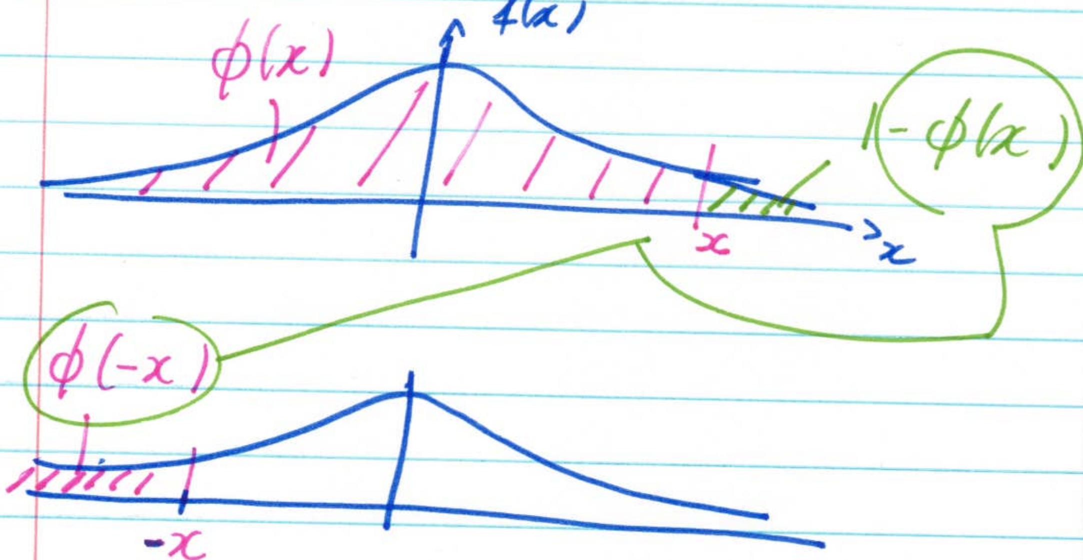
⚠ Never try to compute

$$\int_{-\infty}^{x} e^{-\frac{y^2}{2}}\, dy$$

Picture for $\phi(-x) = 1 - \phi(x)$



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

$P(X \leq .63) \simeq .7353$

$P(X \leq 1.42) \simeq .9222$

$P(X \leq 2.49) \simeq .9936$

Fu $x \geq 2.5$

$P(X \leq x) \simeq 1$

Computations $X \sim N(\mu = 3, \sigma^2 = 9)$

Set: $z = \frac{X - \mu^{3}}{\sigma_{3}}$, then $z \sim N(0,1)$

↳ use tables

① $P(2 < X < 5)$

$= P\left(\frac{2-3}{3} < \frac{X-3}{3} < \frac{5-3}{3}\right)$

$= P\left(-\frac{1}{3} < Z < \frac{2}{3}\right)$

$= \phi\left(\frac{2}{3}\right) - \phi\left(-\frac{1}{3}\right)$

$= \phi\left(\overset{.67}{\frac{2}{3}}\right) - \left(1 - \phi\left(\overset{.33}{\frac{1}{3}}\right)\right)$

$\simeq .7486 - 1 + .6293$

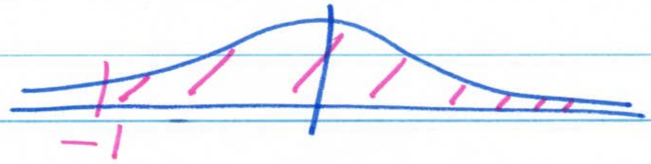
$\simeq .3779$

Computations for $X \sim N(3, 9)$ (cta)

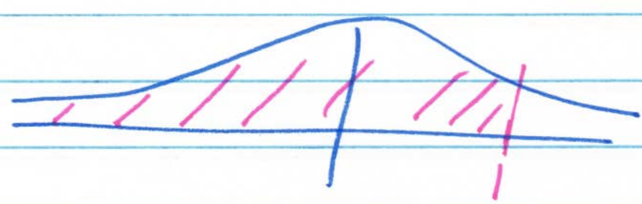
2) $P(X > 0)$

$$= P\left(\frac{X-3}{3} > \frac{0-3}{3} \right)$$

$$= P(Z > -1)$$



=



$$= P(Z \le 1) = \phi(1)$$

$$\simeq .8413$$

Comp. for $X \sim N(3, 9)$ (ctd)

3 $P(|X-3| > 6)$ $\quad P(A) = 1 - P(A^c)$

$= 1 - P(|X-3| \leq 6)$

$= 1 - P(|Z| \leq 2)$

$= 1 - P(-2 \leq Z \leq 2)$

$= 1 - [\phi(2) - \phi(-2)]$

$= 1 - [\phi(2) - (1 - \phi(2))]$

$= 2(1 - \phi(2))$

$\simeq .0456$

i.i.d

= independent and identically distributed

Enrollment overbooking

We get $X \sim Bin(n, p)$

We have n large $(n = 450)$

$p = .3$ (not small)

Thus (de Moivre)

$X \approx N(\cancel{m}\, np, np(1-p))$

We wish to compute

$P(X > 150)$

Enrollment overbooking. (ctd)

$$P(X > 150) \overset{\uparrow \text{ continuity correction}}{=} P(X \geq 150.5)$$

$$= P\left(\frac{X - np}{(np(1-p))^{\frac{1}{2}}} \geq \frac{150.5 - np}{(np(1-p))^{\frac{1}{2}}} \right)$$

$$= P\left(\frac{X - 450 \times .3}{(450 \times .3 \times .7)^{\frac{1}{2}}} \geq \underbrace{\frac{150.5 - 450 \times .3}{(450 \times .3 \times .7)^{\frac{1}{2}}}}_{= 1.59} \right)$$

De Moivre

$$\simeq P(Z > 1.59)$$

$$= 1 - \phi(1.59)$$

$$\simeq 5.59\%$$