CALCULUS AND STATISTICS

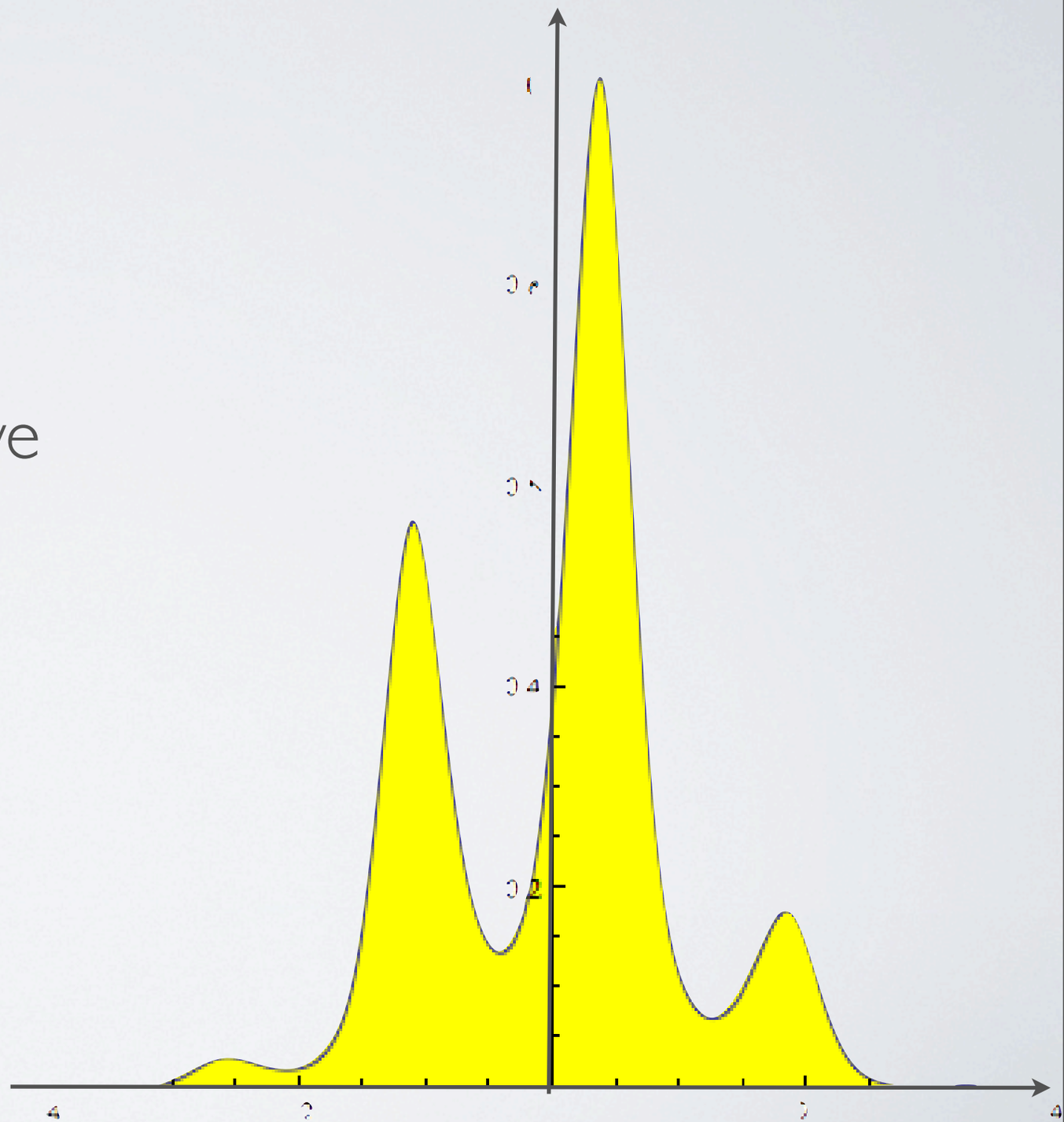
MATH 1A

Oliver Knill, Harvard University

April 24, 2013

PDF

- The total integral is 1
- The function is nonnegative



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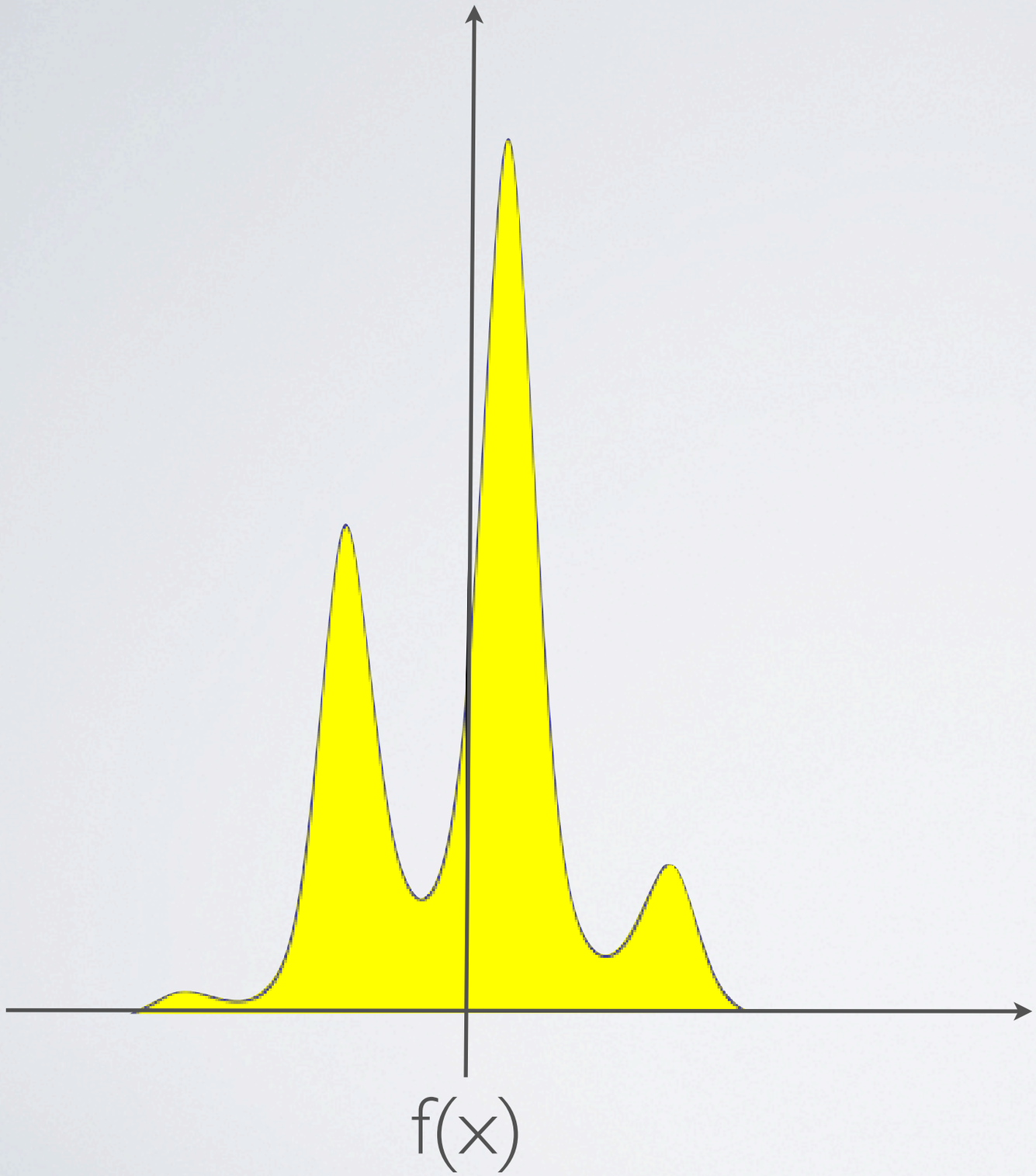
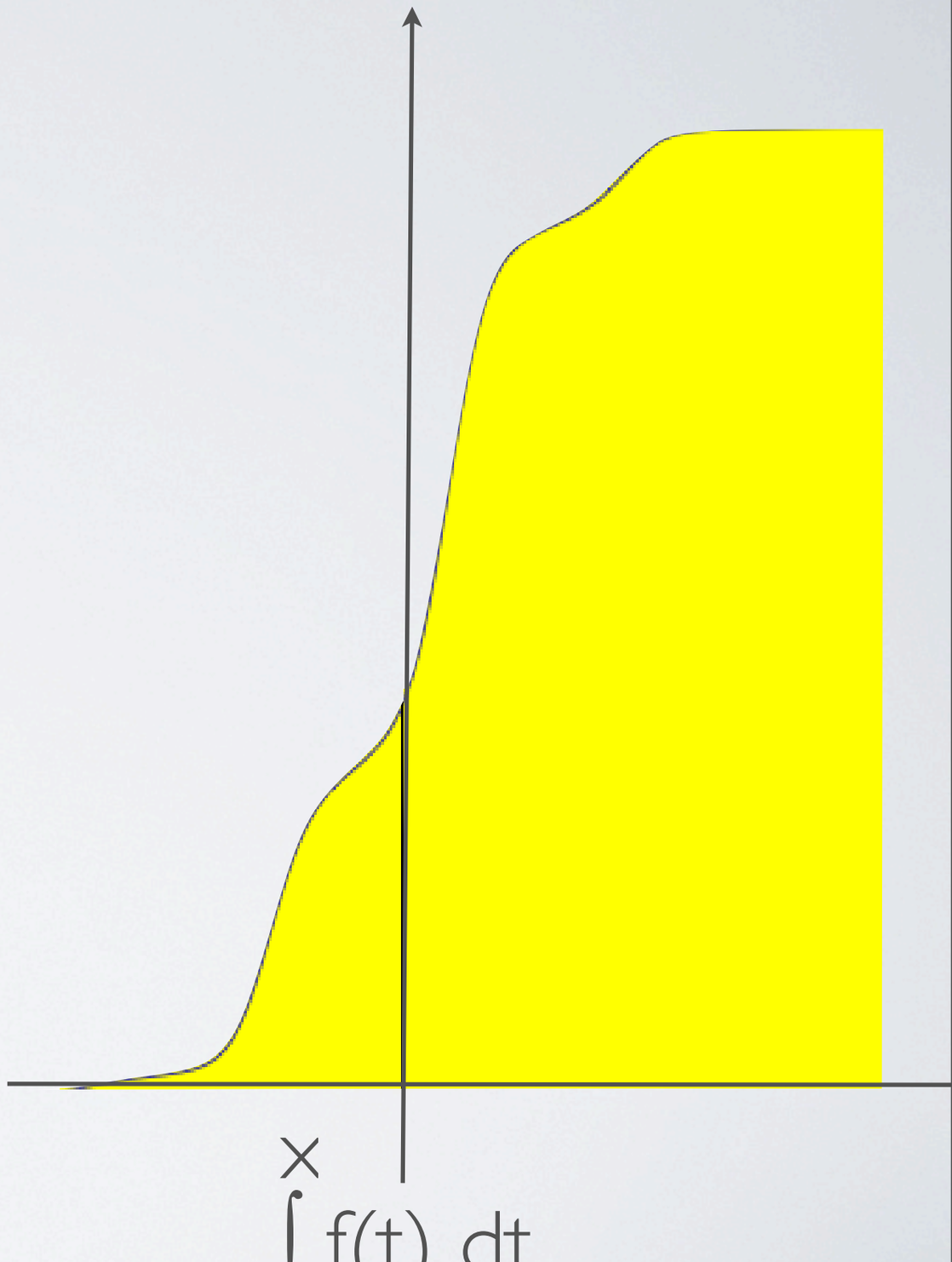
CDF



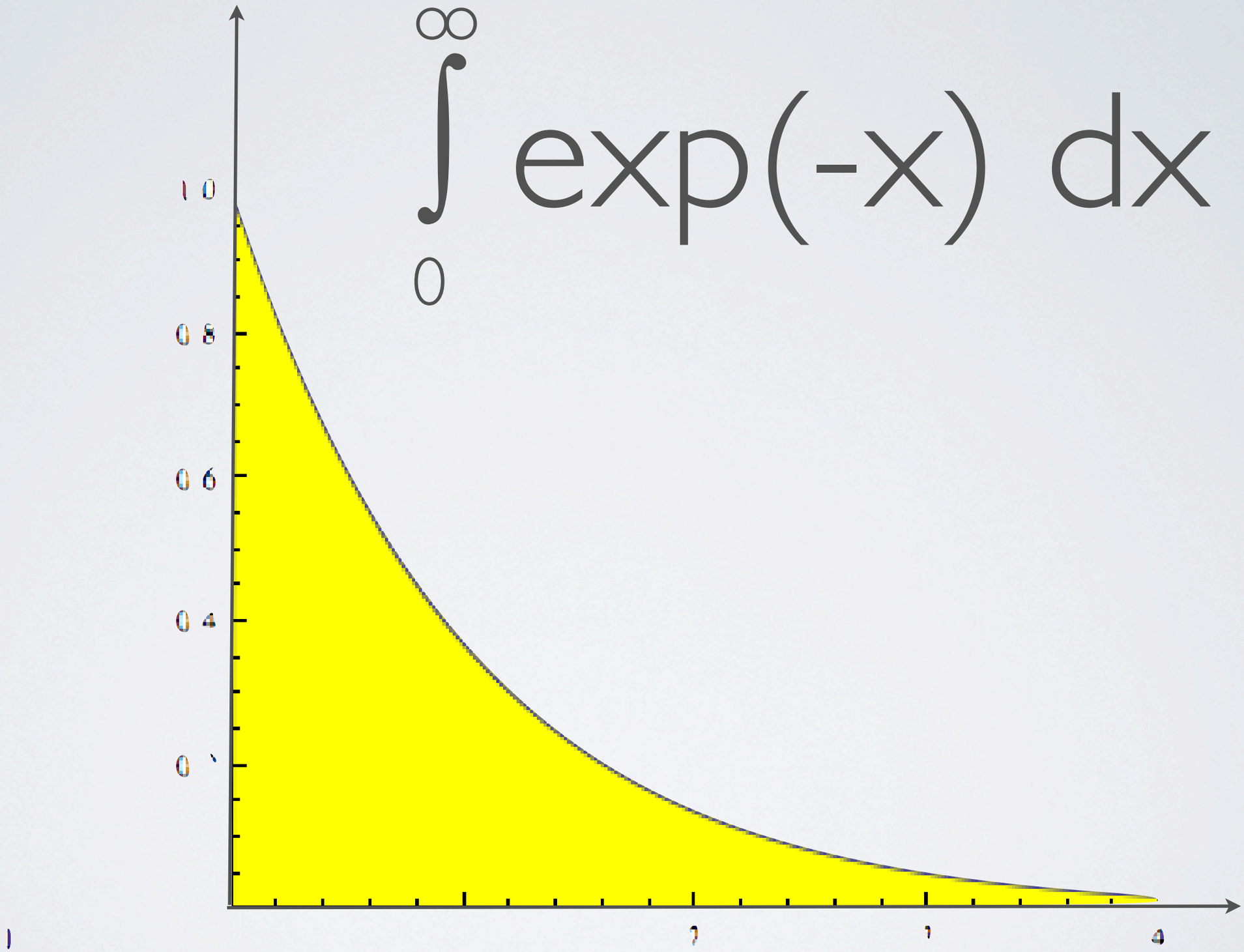
f(x)



$$\int_{-\infty}^{x} f(t)\,dt$$

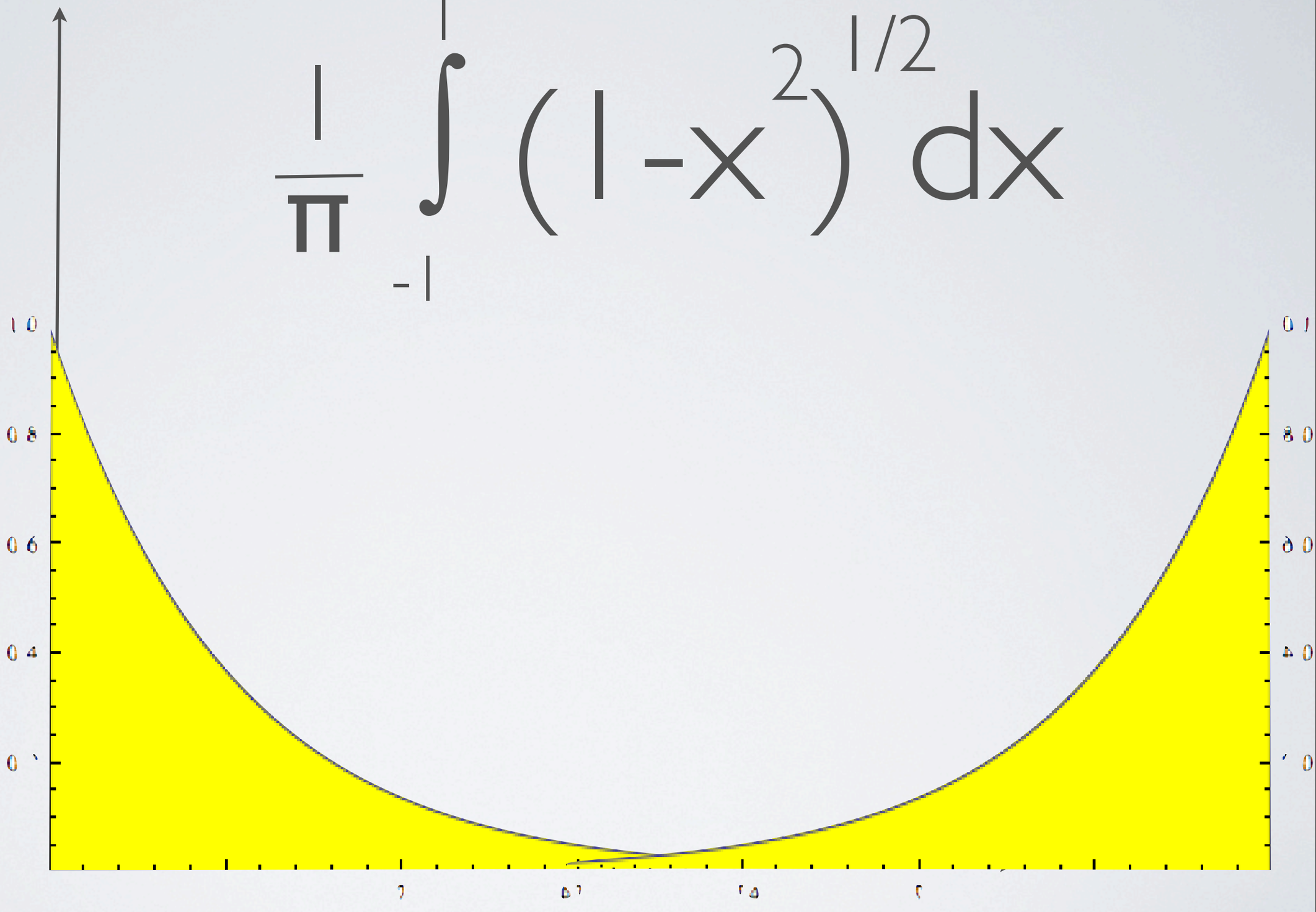
EXPONENTIAL

$$\int_0^\infty \exp(-x)\,dx$$



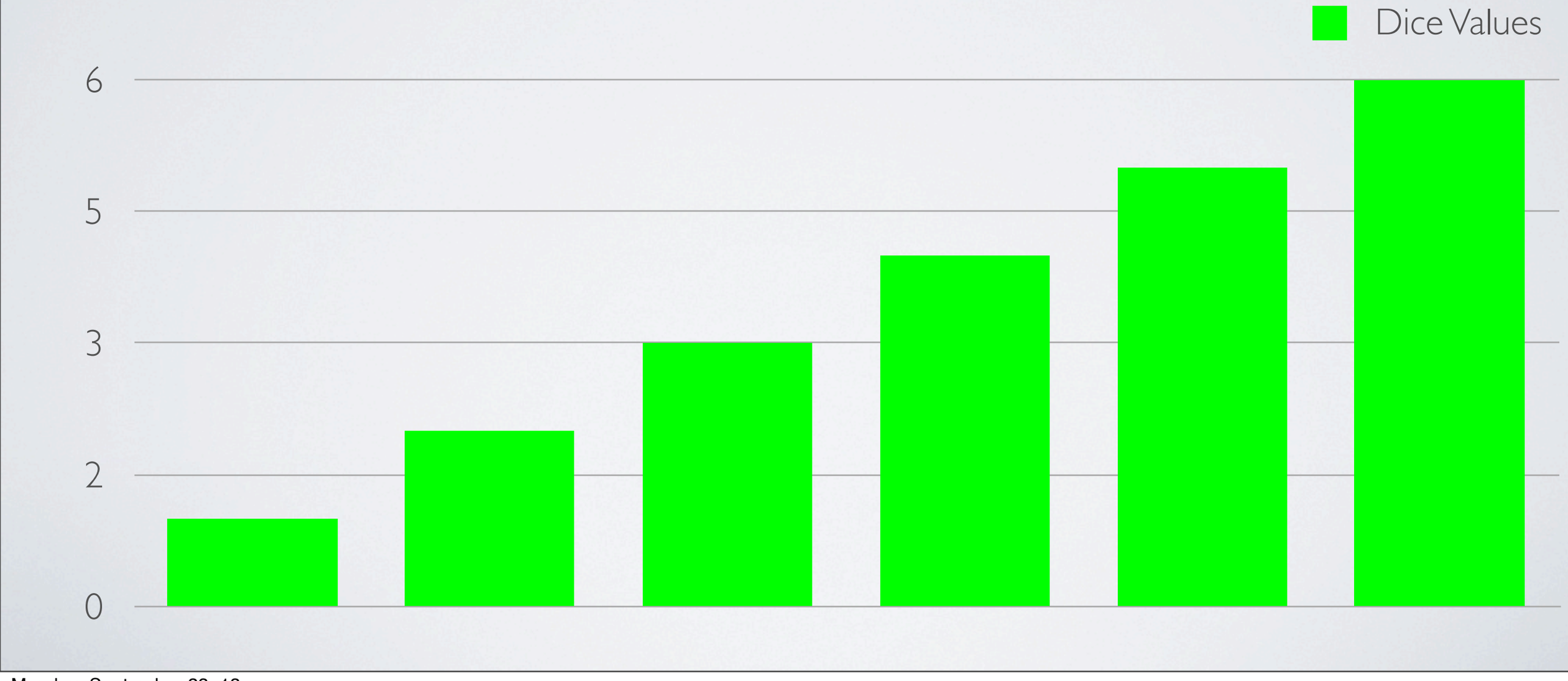
ARCSIN

$$\frac{1}{\pi}\int_{-1}^{1}\left(1-x^{2}\right)^{1/2}dx$$

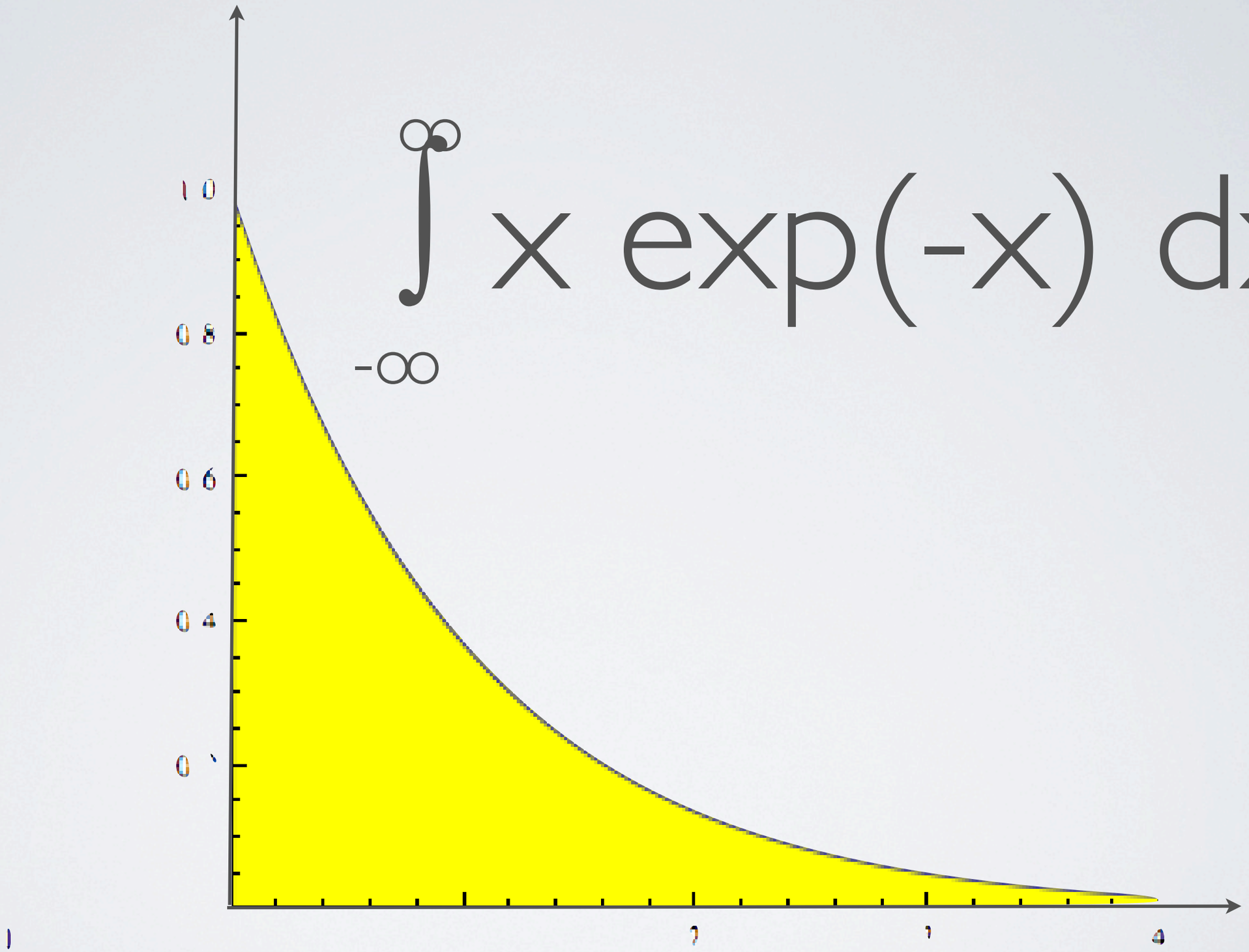


EXPECTATION

$$\int_{-\infty}^{\infty} x \, f(x) \, dx$$



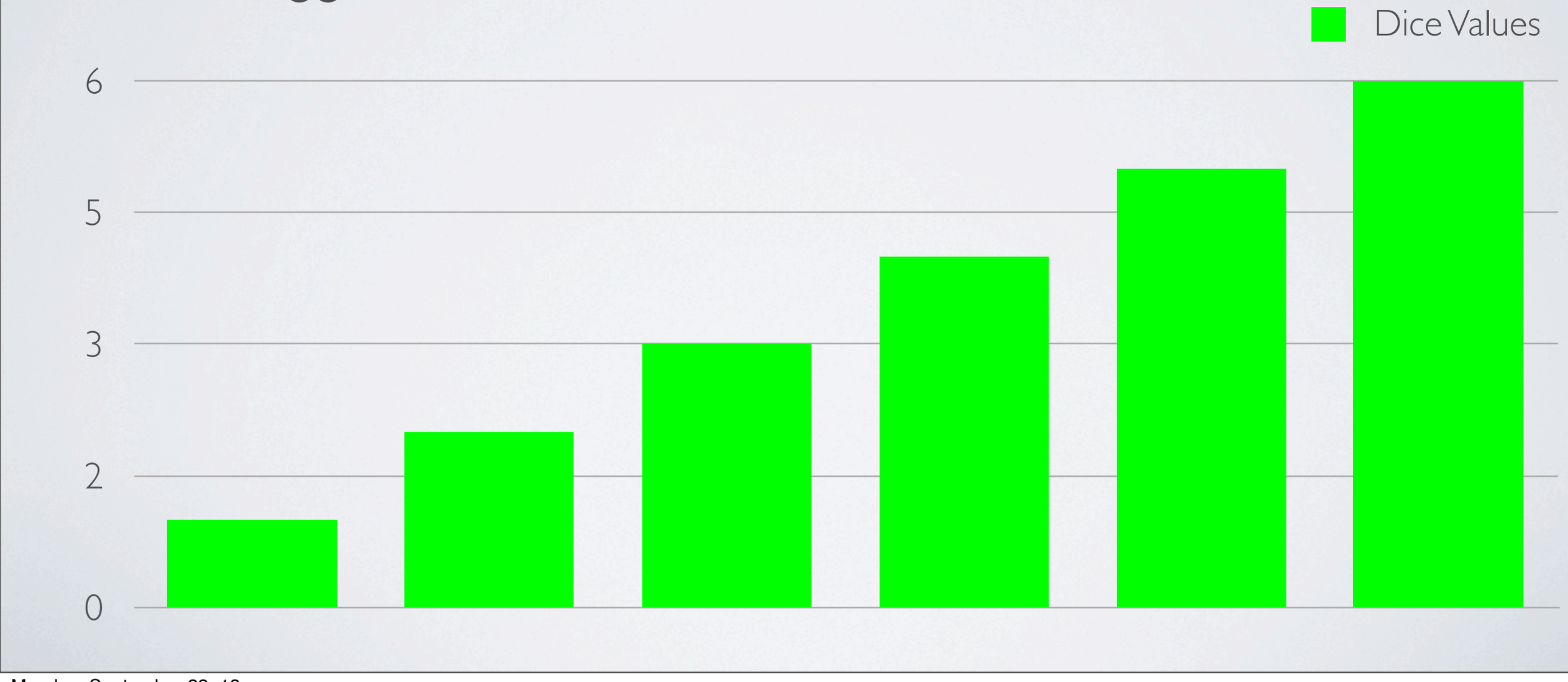
EXPONENTIAL



$$\int_{-\infty}^{\infty} x \exp(-x)\, dx$$

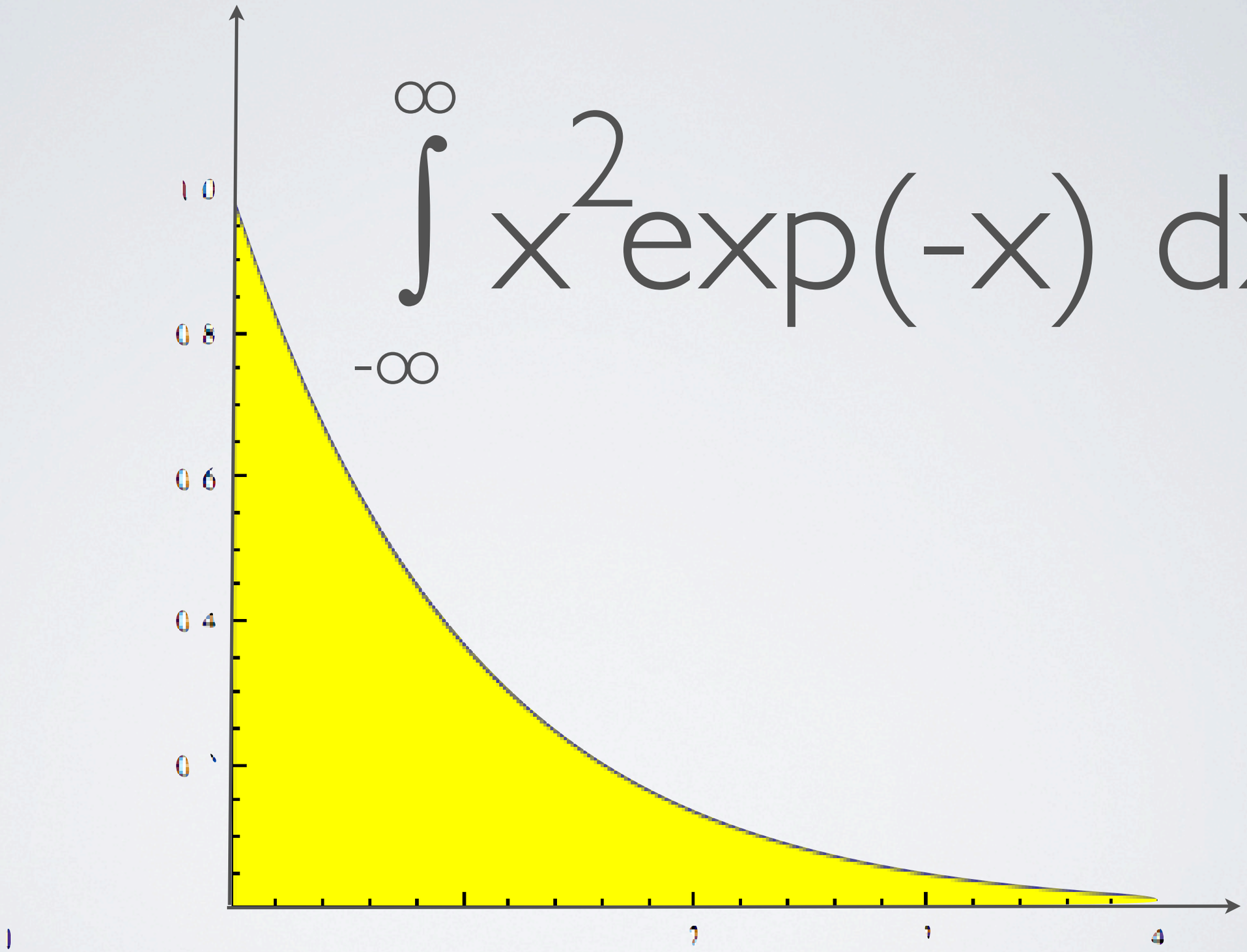
VARIANCE

$$\int_{-\infty}^{\infty} x^2 f(x)\, dx - m^2$$



EXPONENTIAL

$$\int_{-\infty}^{\infty} x^2 \exp(-x)\, dx$$



COMPUTING THE VARIANCE

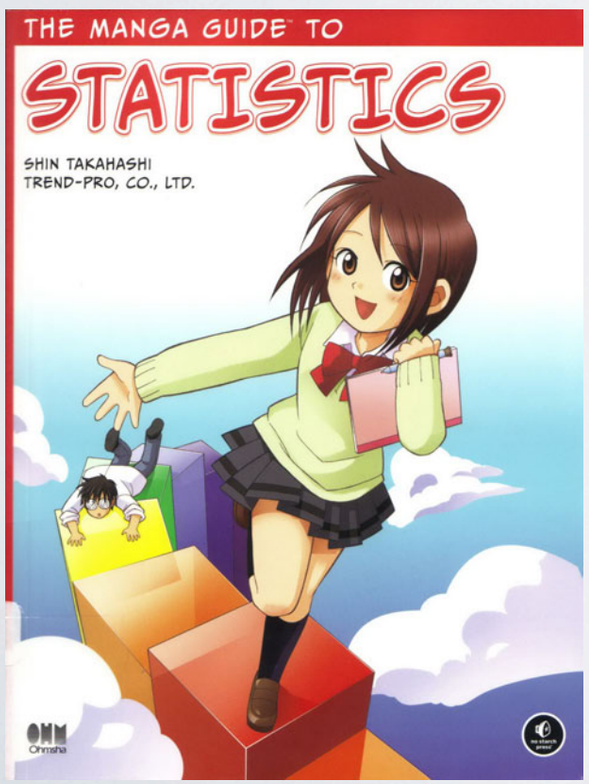
$$\int 1 \exp(-x/2)\, dx$$

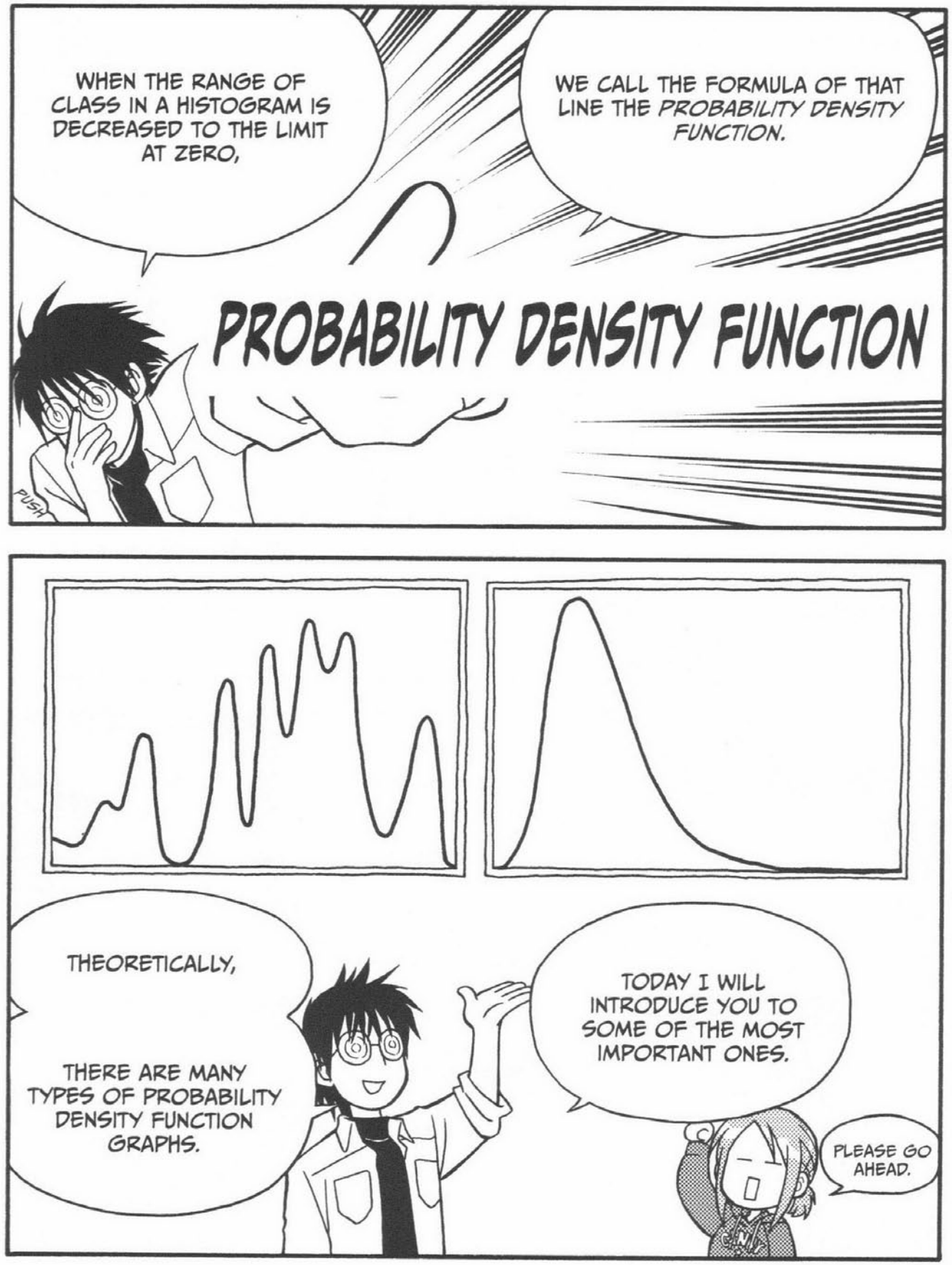
$$= x \exp(-x^2/2) +$$

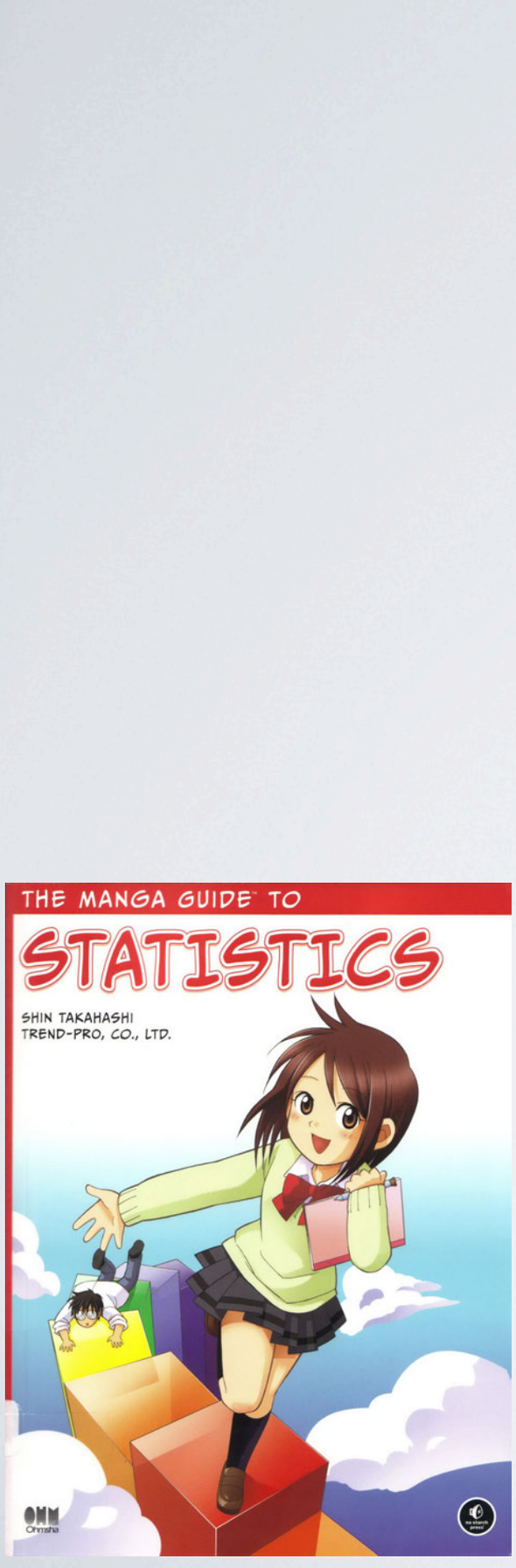
$$\int x^2 \exp(-x/2)\, dx$$

MANGA STYLE

PDF



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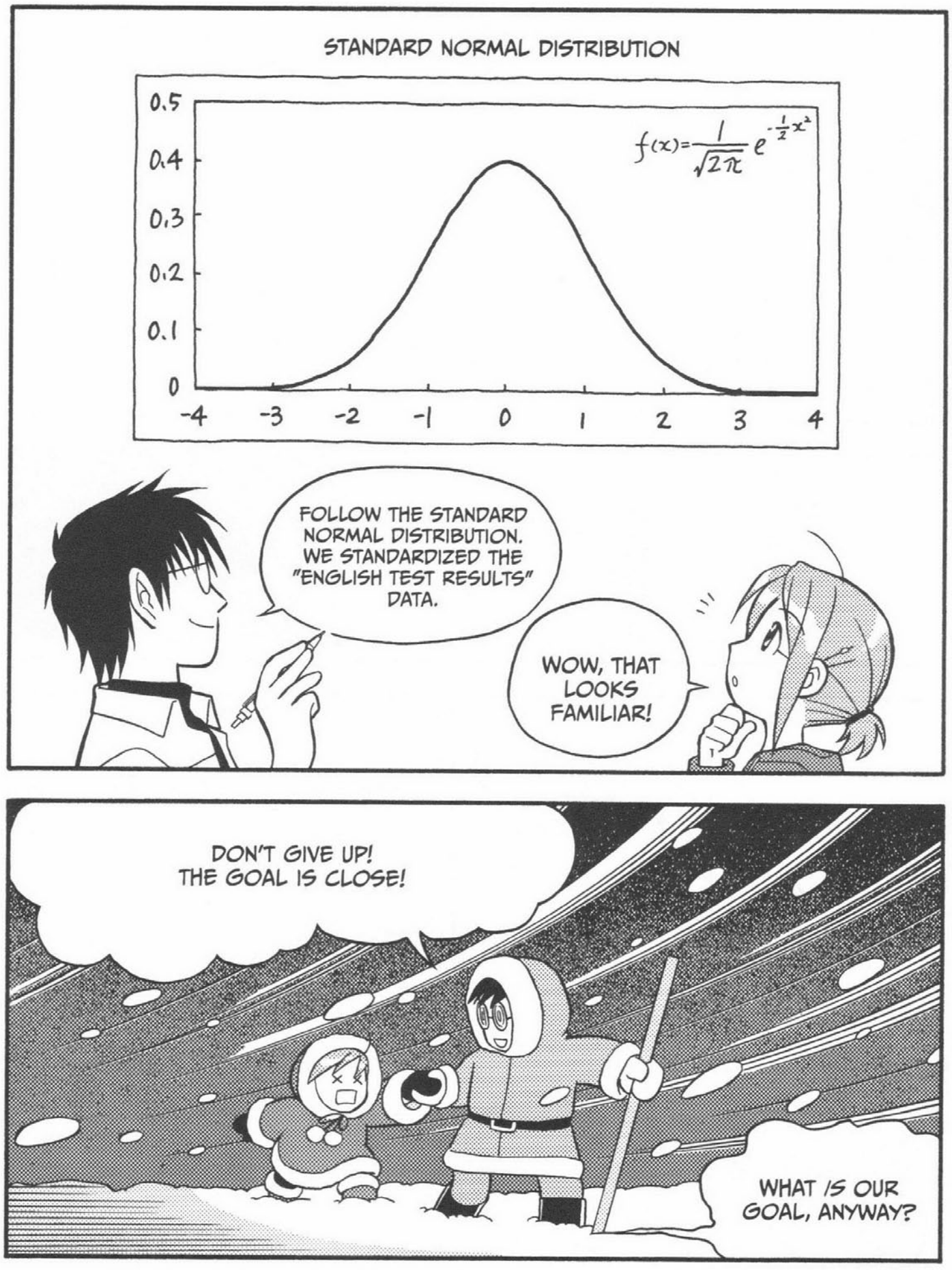
STANDARD NORMAL DISTRIBUTION
0.5
0.4
0.3
0.2
0.1
0
-4
-3
-2
-1
0
1
2
3
4
$f(x)=\frac{1}{\sqrt{2\pi}}e^{-\frac{1}{2}x^2}$
FOLLOW THE STANDARD NORMAL DISTRIBUTION. WE STANDARDIZED THE "ENGLISH TEST RESULTS" DATA.
WOW, THAT LOOKS FAMILIAR!
DON'T GIVE UP! THE GOAL IS CLOSE!
WHAT IS OUR GOAL, ANYWAY?