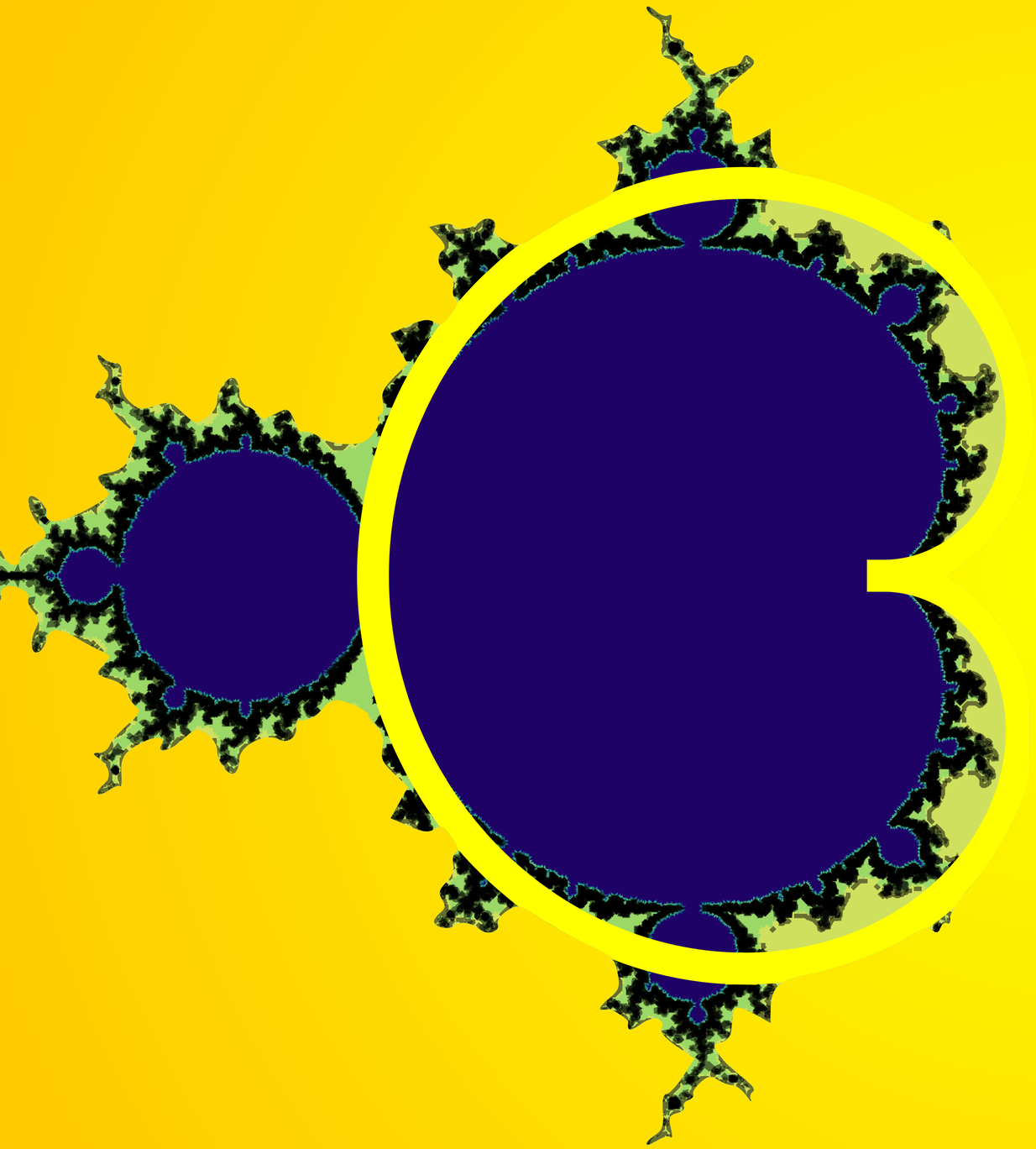

Lecture 7

Polar Integrals

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1) Integration factor

2) Moment of Inertia

3) Worksheet problems

4) The gifted problem

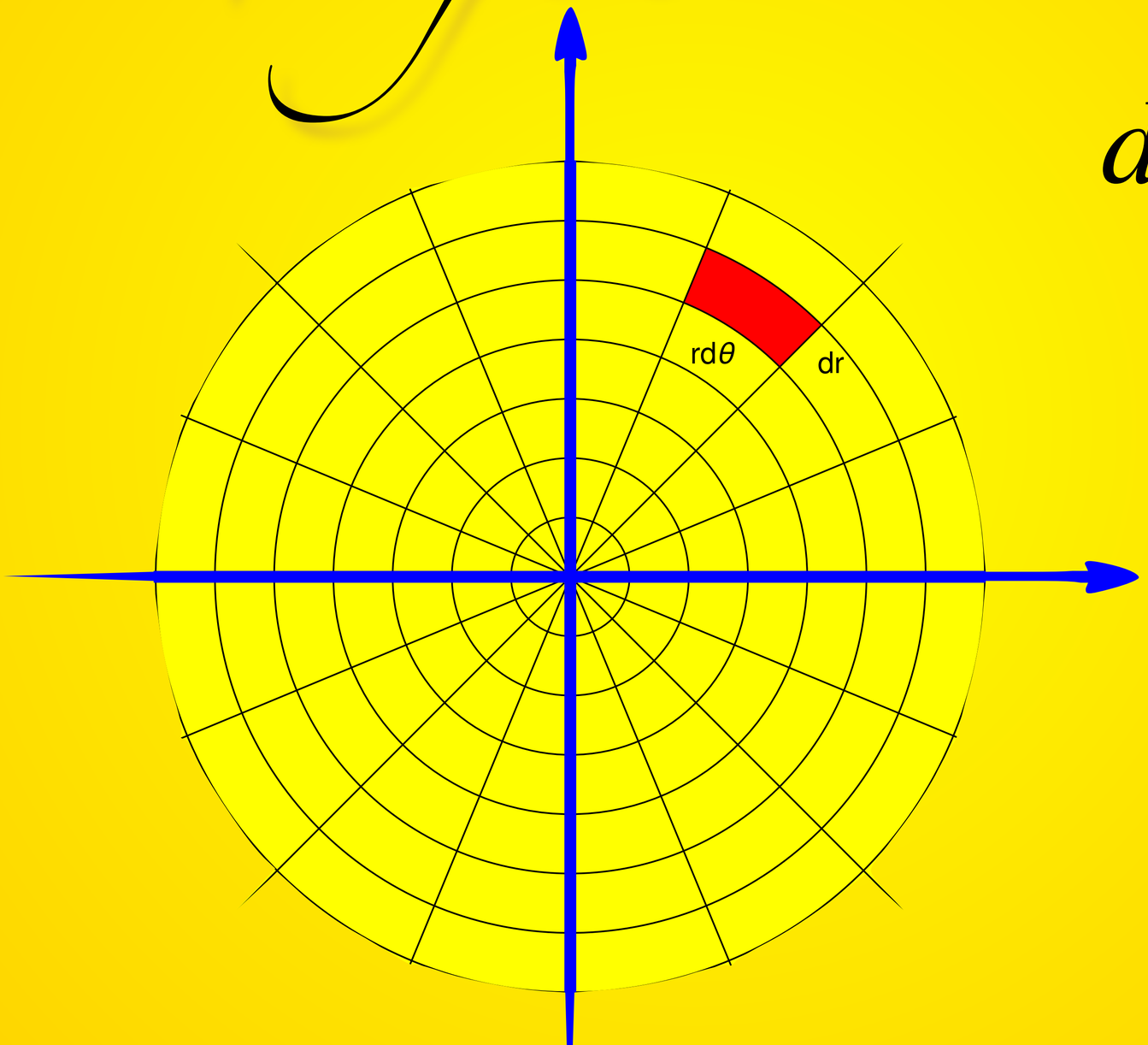
5) Rest of Worksheet problems

Integration factor

Integration Factor

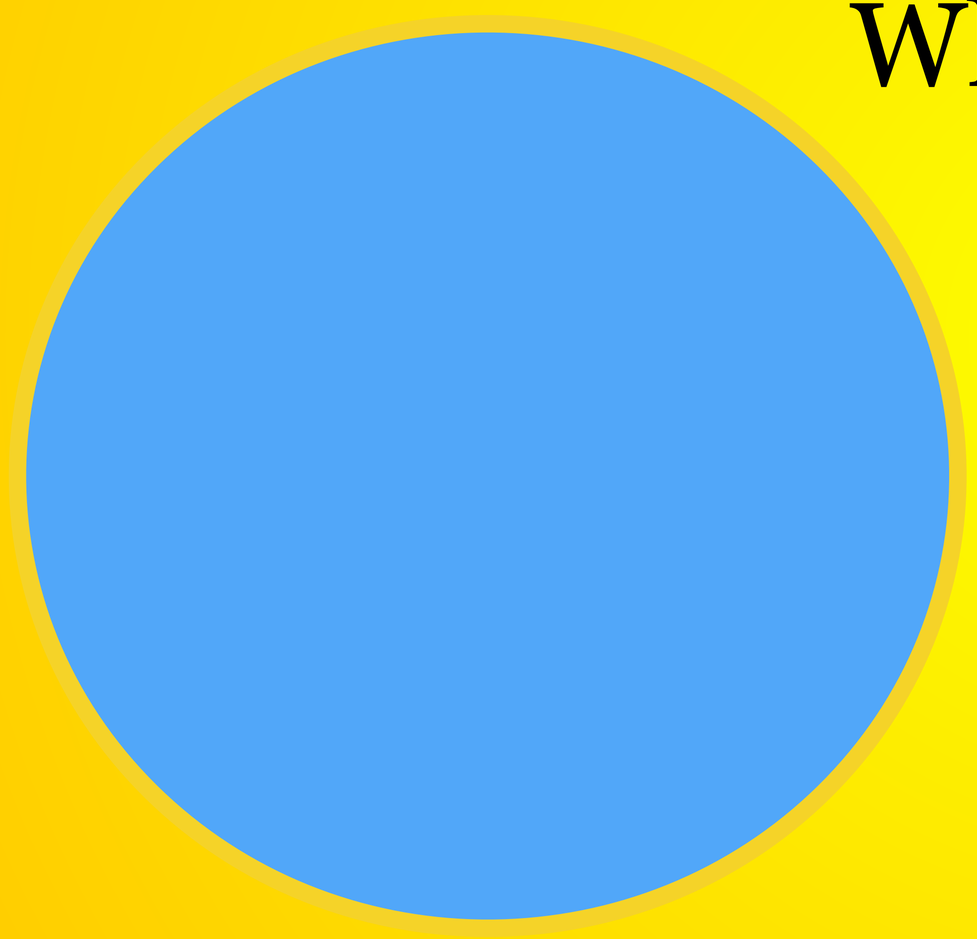
When converting to polar coordinates, include an integration factor r.

Argument



$$dA = rdrd\theta$$

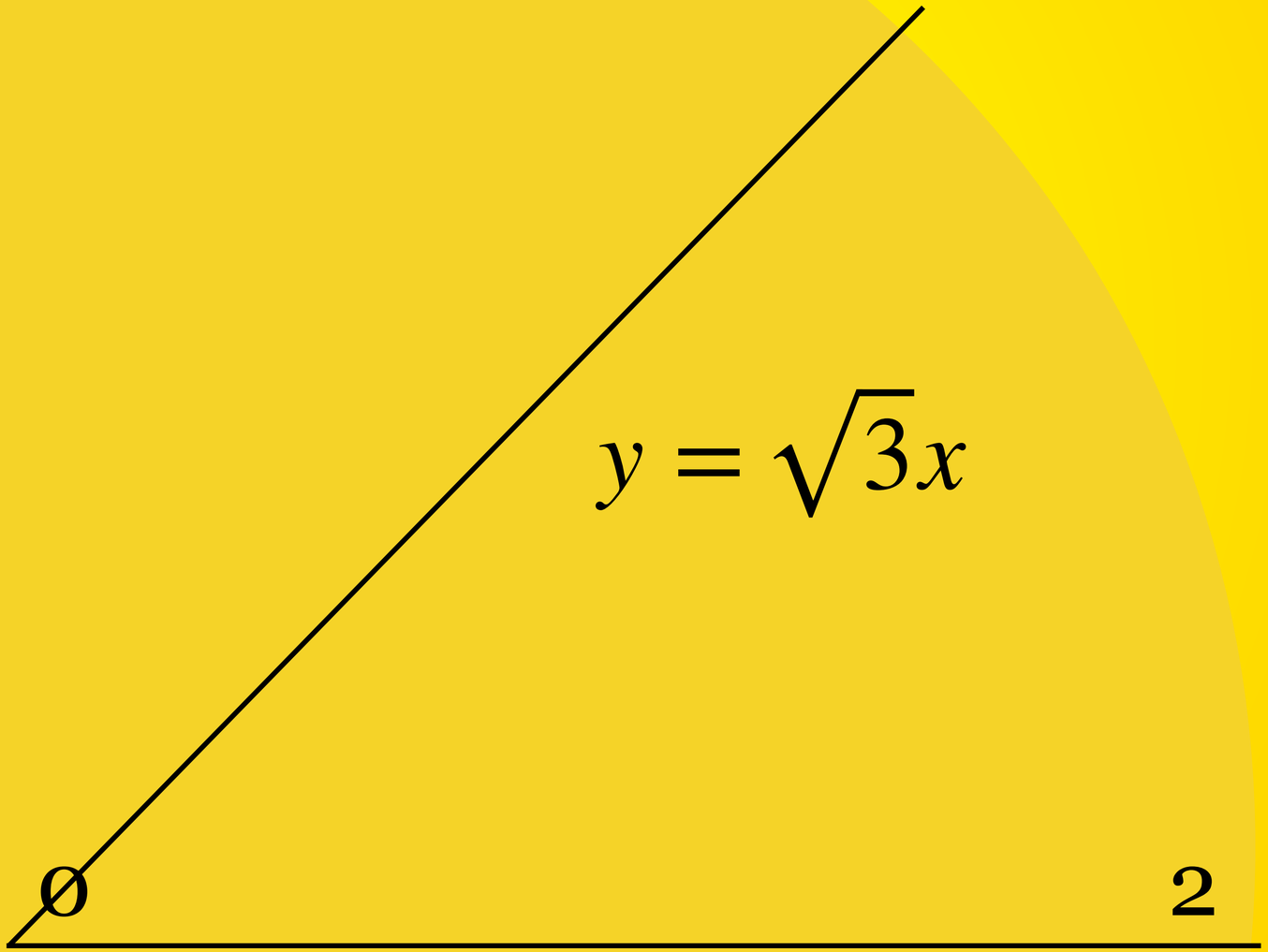
Examples



What is $\iint_R x^2 + y^2 \, dA$

if R is the unit disk?

Problem 4



From Statistics

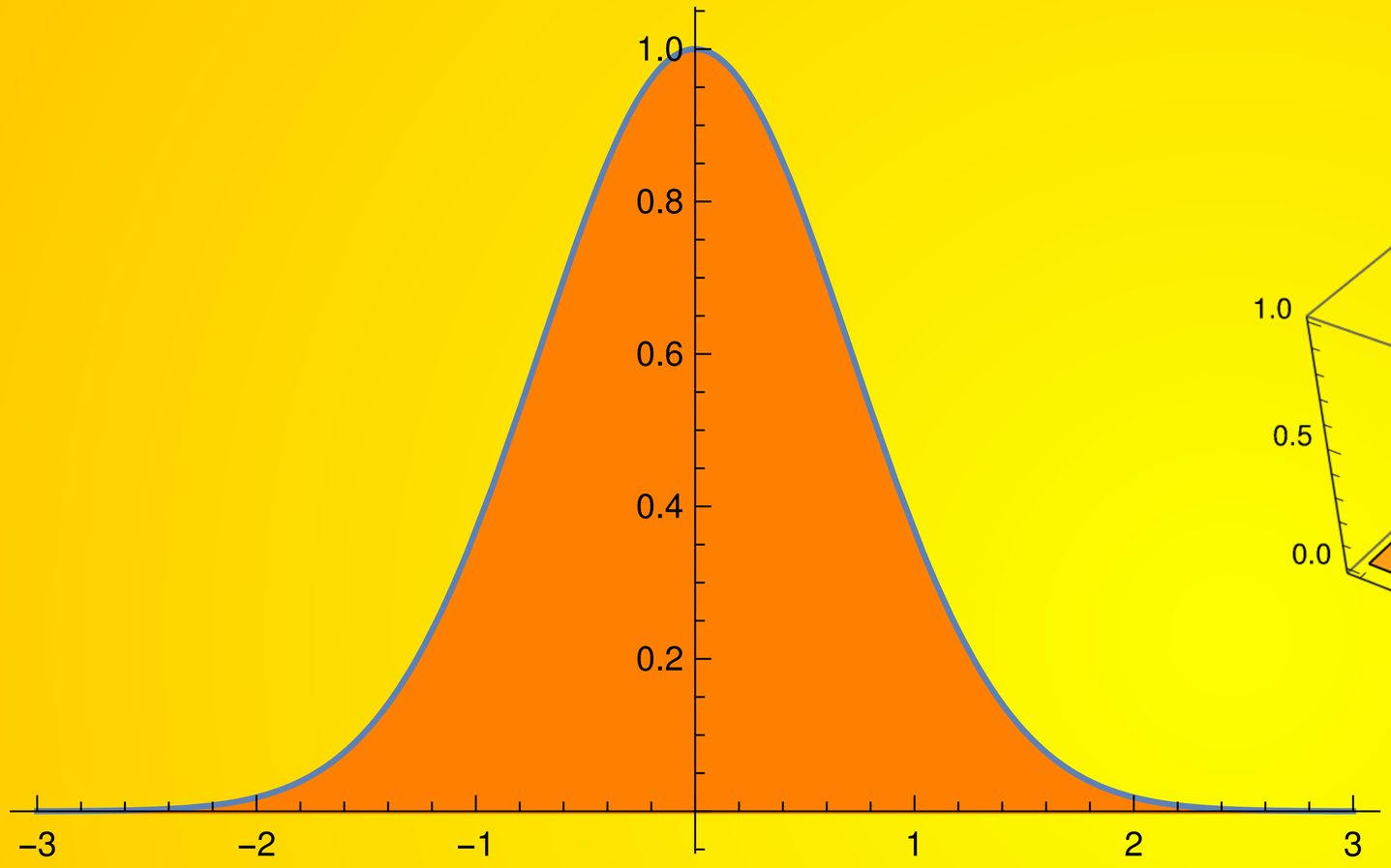
$$\int_{-\infty}^{\infty} e^{-x^2} dx$$

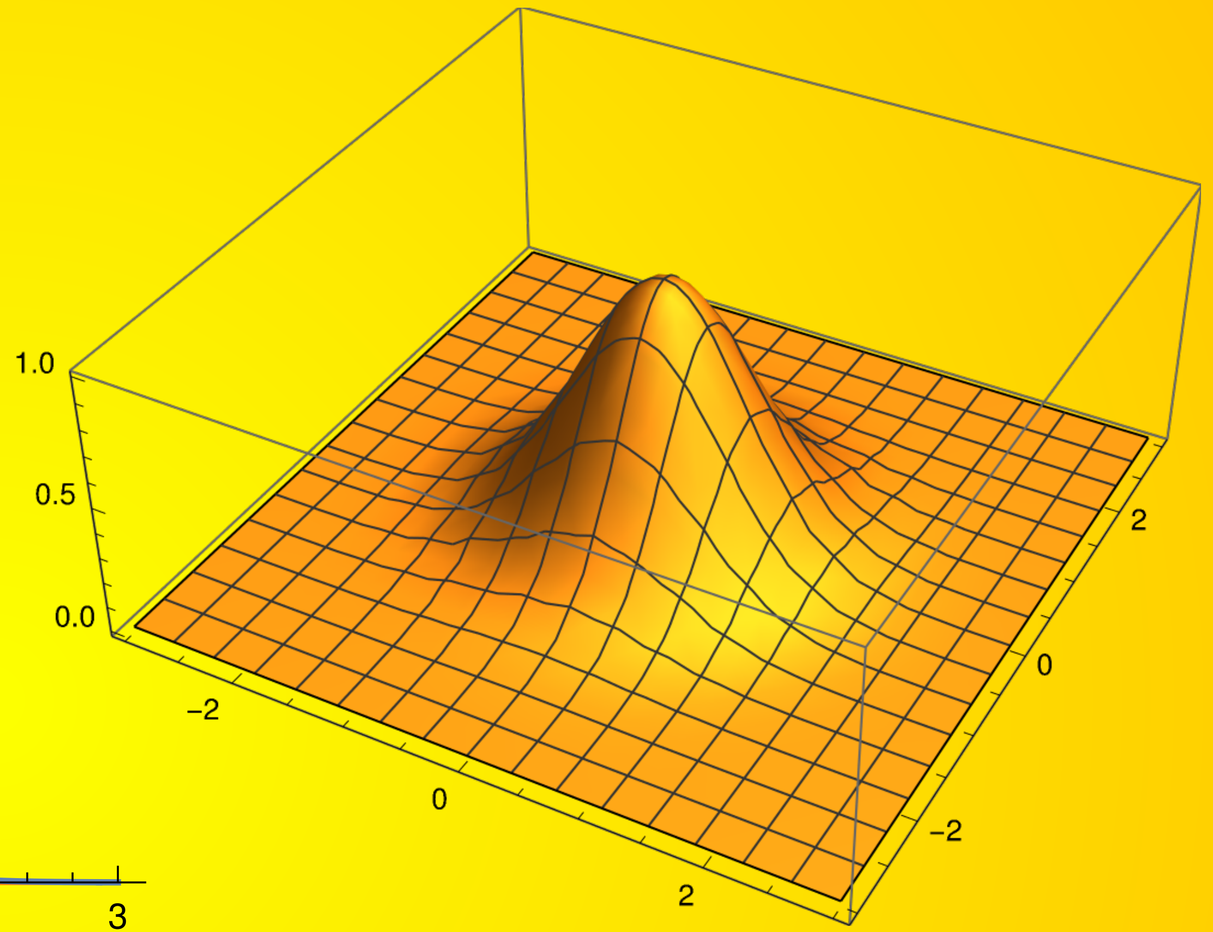
Problem

Show that $\int_{-\infty}^{\infty} e^{x^2/2\sigma^2} dx = \sqrt{2\pi}\sigma$

Hint: First show that

$$\int_{-\infty}^{\infty}\int_{-\infty}^{\infty} e^{(x^2+y^2)/2\sigma^2} dx\,dy = 2\pi$$

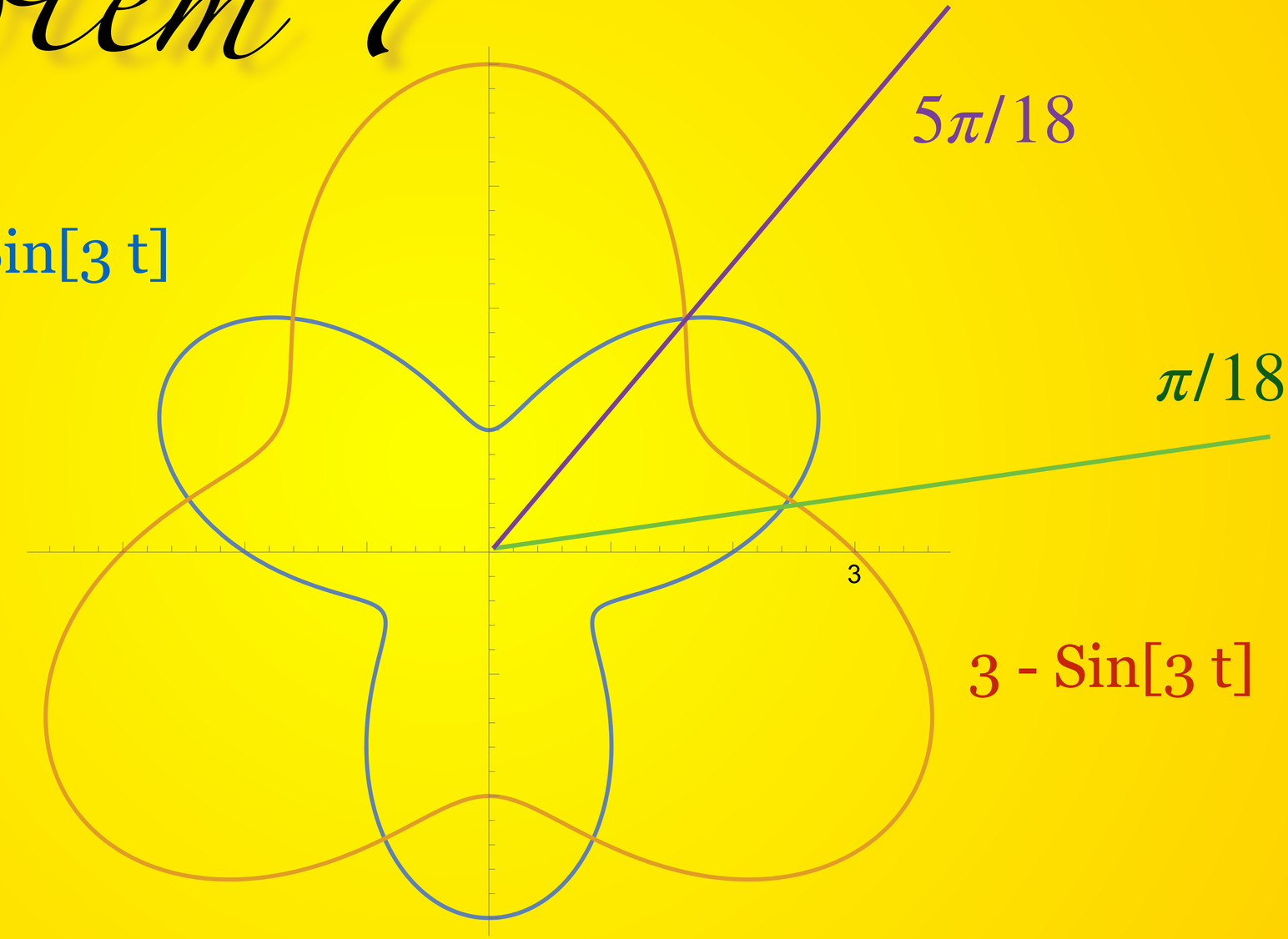




$$\int_{-\infty}^{\infty} e^{-x^2} dx = \sqrt{\pi}$$

$$\iint_{\mathbb{R}^2} e^{-x^2-y^2} dA = \pi$$

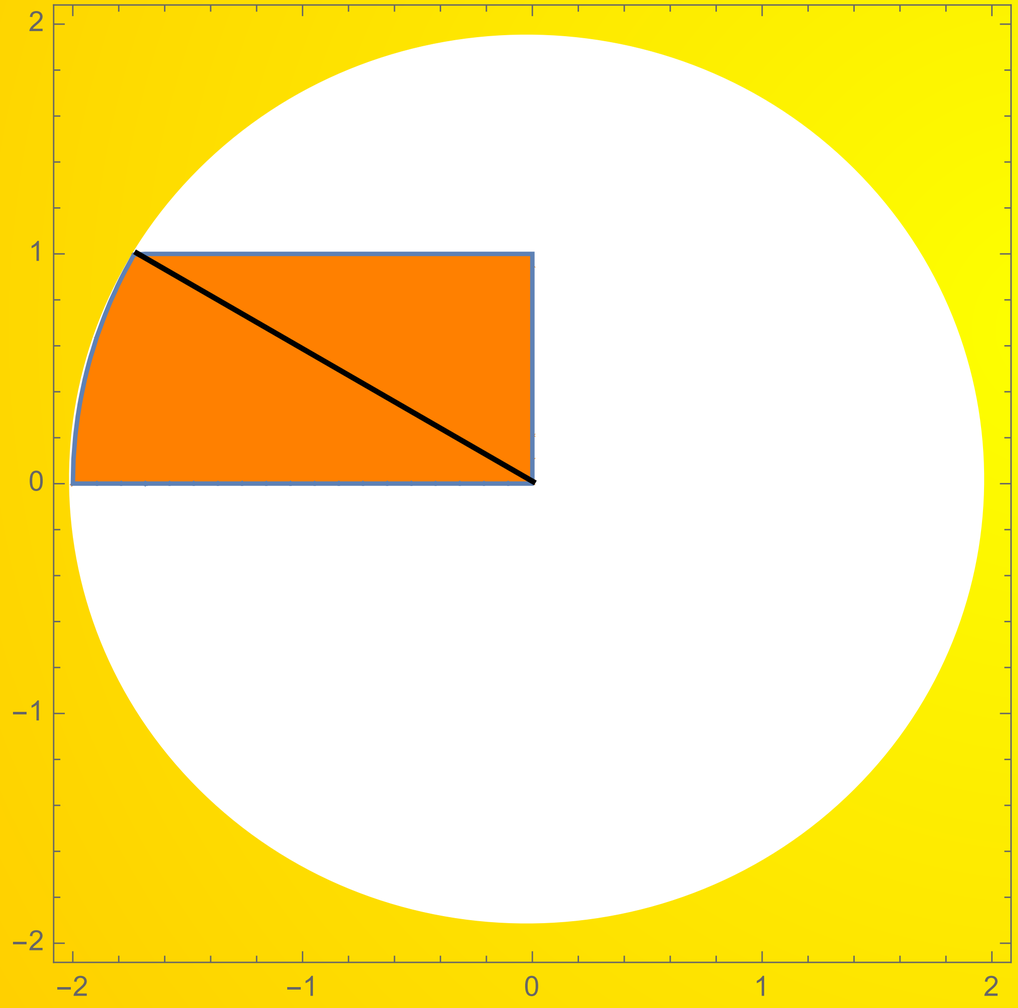
Problem 7



2 + Sin[3 t]

3 - Sin[3 t]

Problem 8



(Either slice
horizontally
and use cartesian
coordinates (still
involving square roots)
Or then split into two parts
The triangle can be done in Cartisan,
the sector in polar coordinates.)

Homework due Wednesday

THE END