PhysH308

Continued review of Newtonian Mechanics
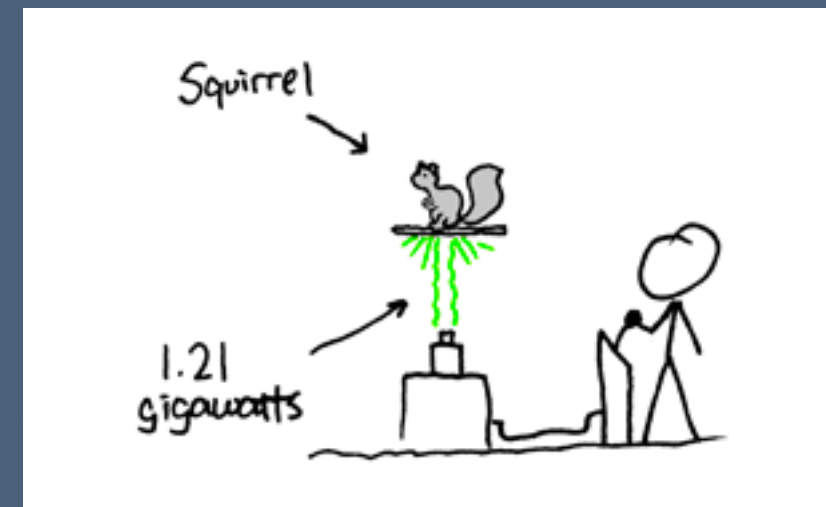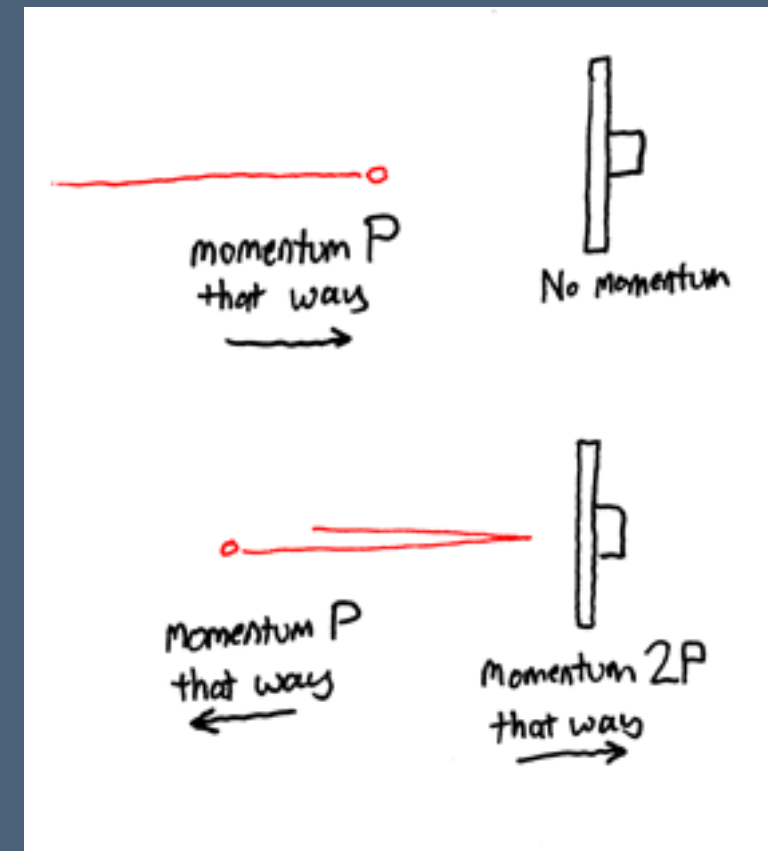
Ted Brzinski, Sept 7, 2024

Course logistics

- Exam 1:

  - I will post tomorrow or Saturday (I'll send an email)

  - Take-home, self-timed (still writing, but I'm aiming for 90 minutes or less)

  - Open notes

  - Due eight days from posting. No exceptions or extensions. (Recall, you'll have 6-7 more chances!)
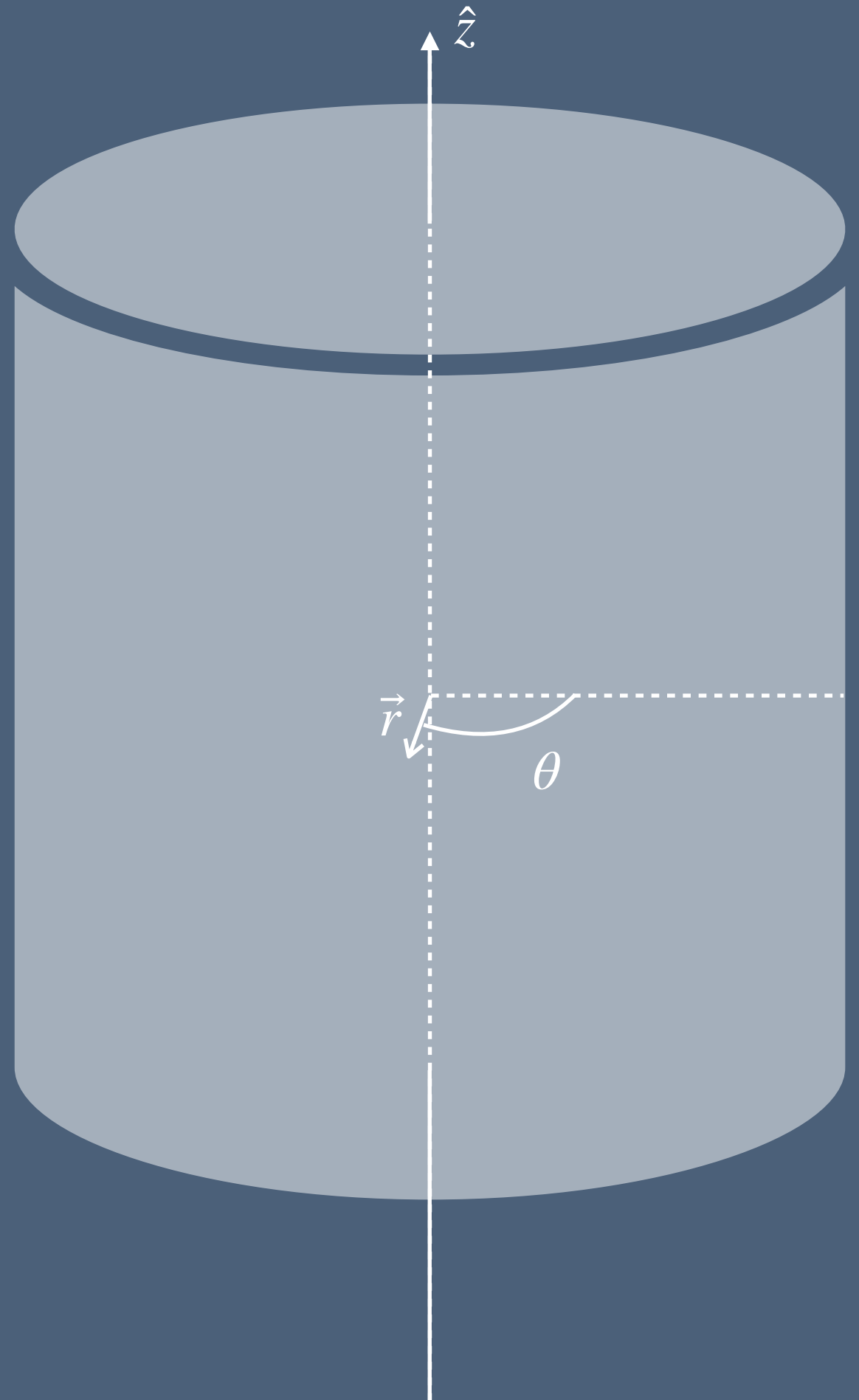
Problems for Tuesday

- 3.5 - Billiards, elastic collision

- 3.10 - a tricky rocket problem.
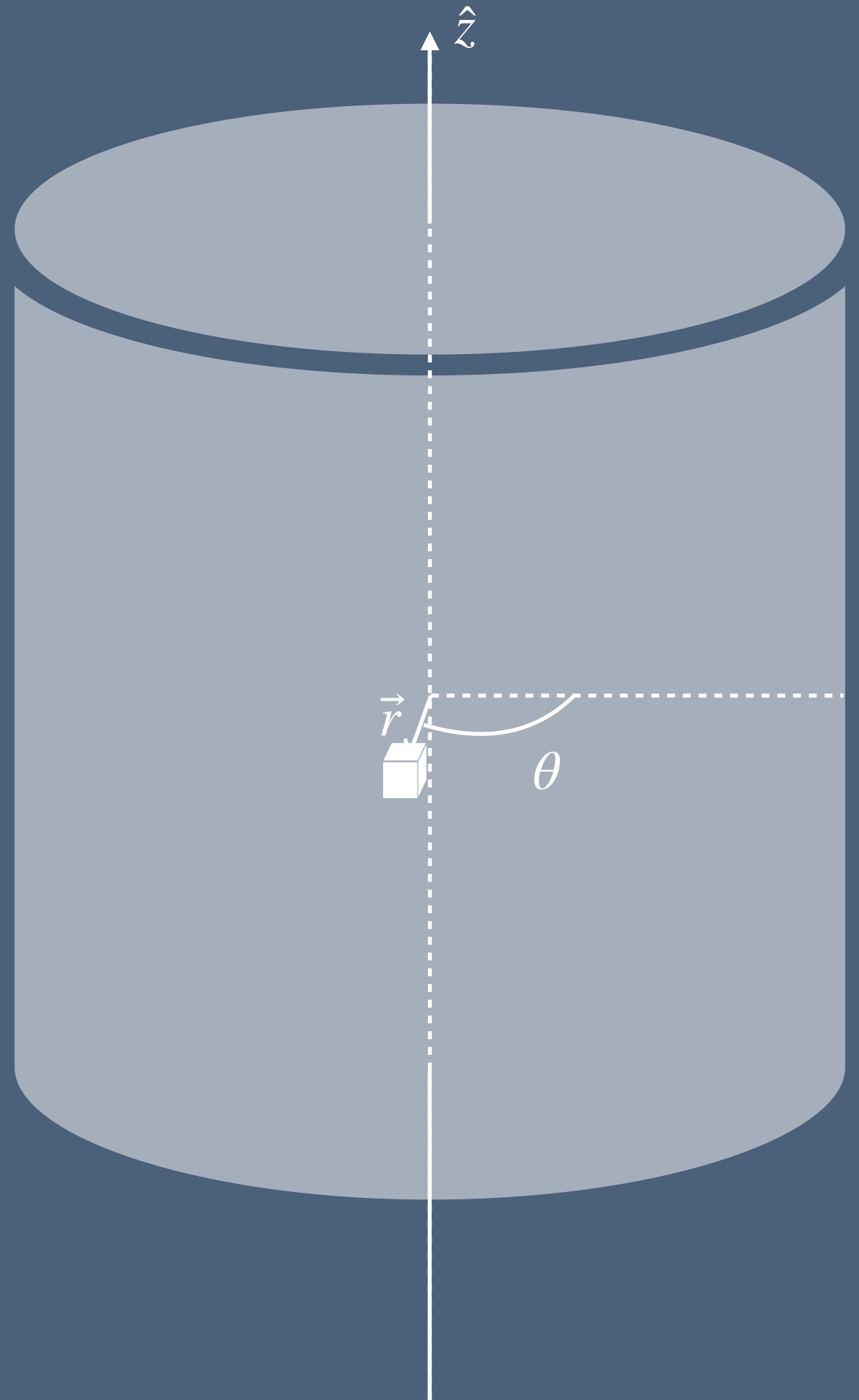
- 3.22 - Finding the center of mass

momentum P that way — No momentum

momentum P that way — momentum 2P that way

Squirrel

1.21 gigawatts

Problems for Tuesday

- 3.22 - Asks you to explain
$$dV = r^2 \sin(\phi)\, dr\, d\theta\, d\phi$$
in spherical coordinates

- Here's how I'd do that for
$dV = r\, dr\, d\theta\, dz$ in
cylindrical coordinates...

$\hat{z}$

$\vec{r}$

θ

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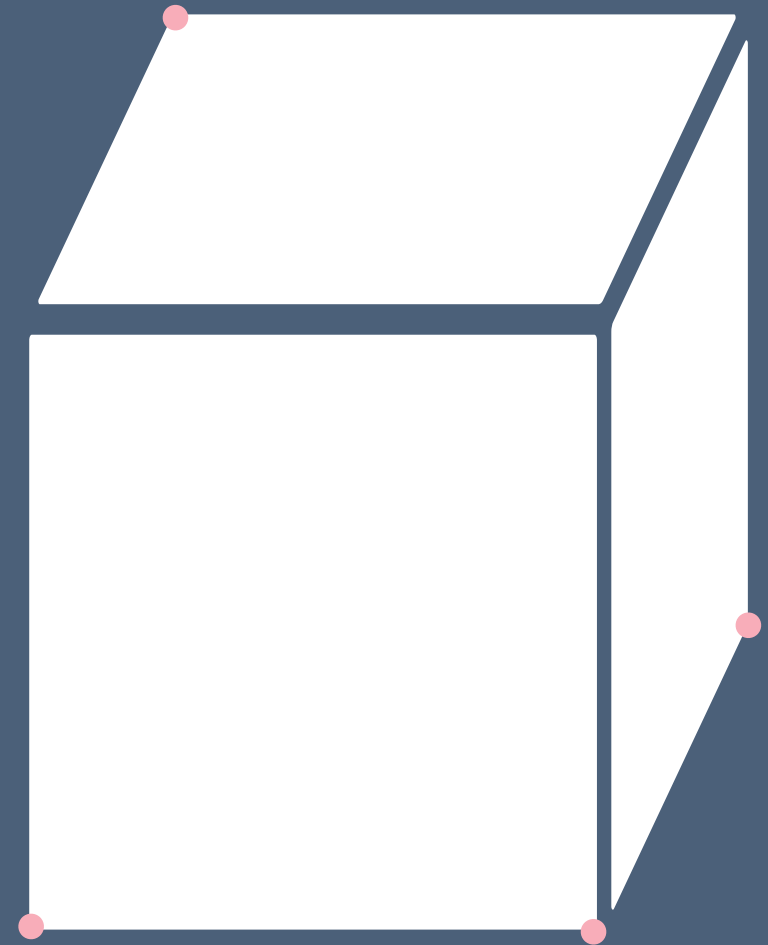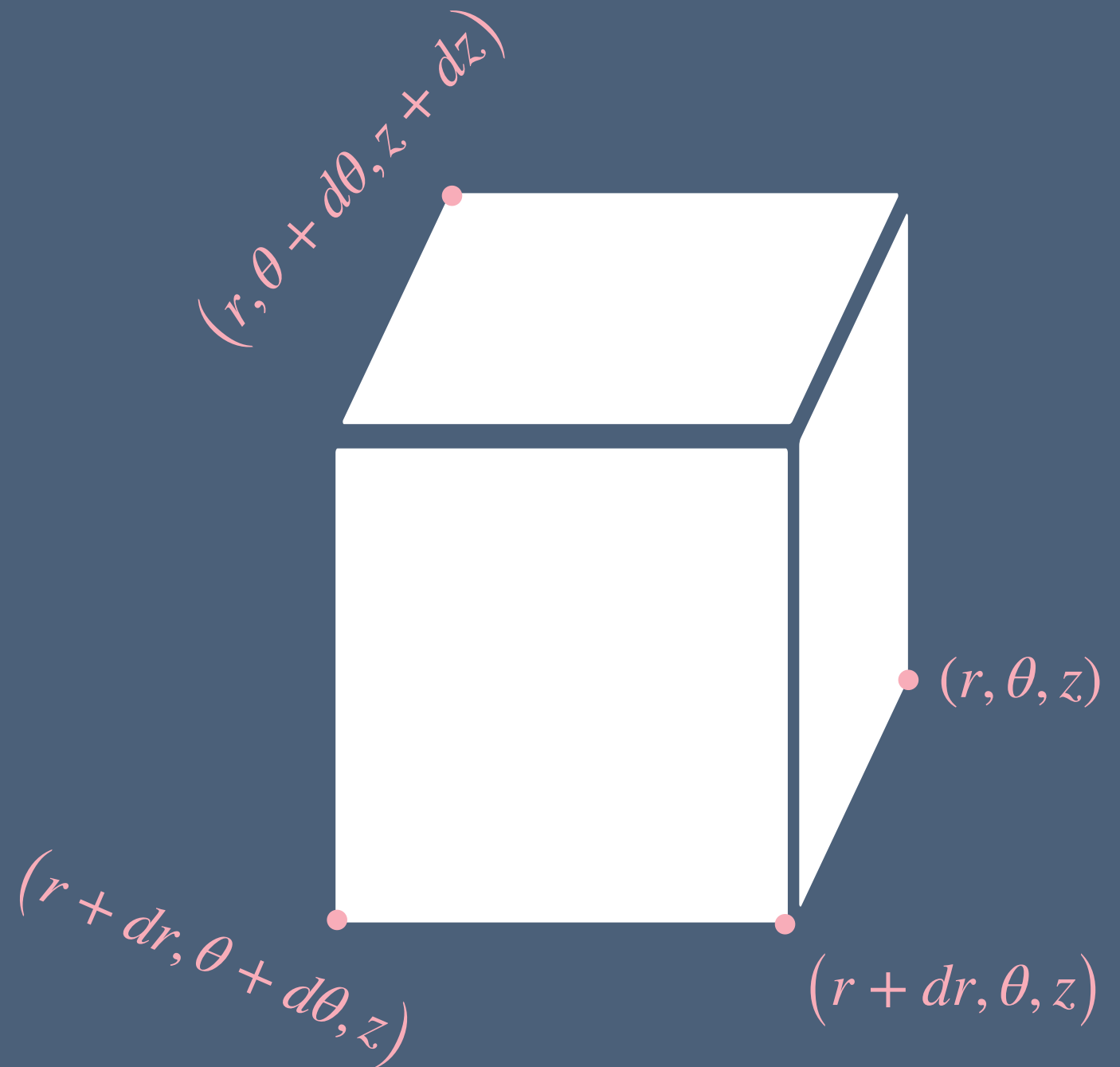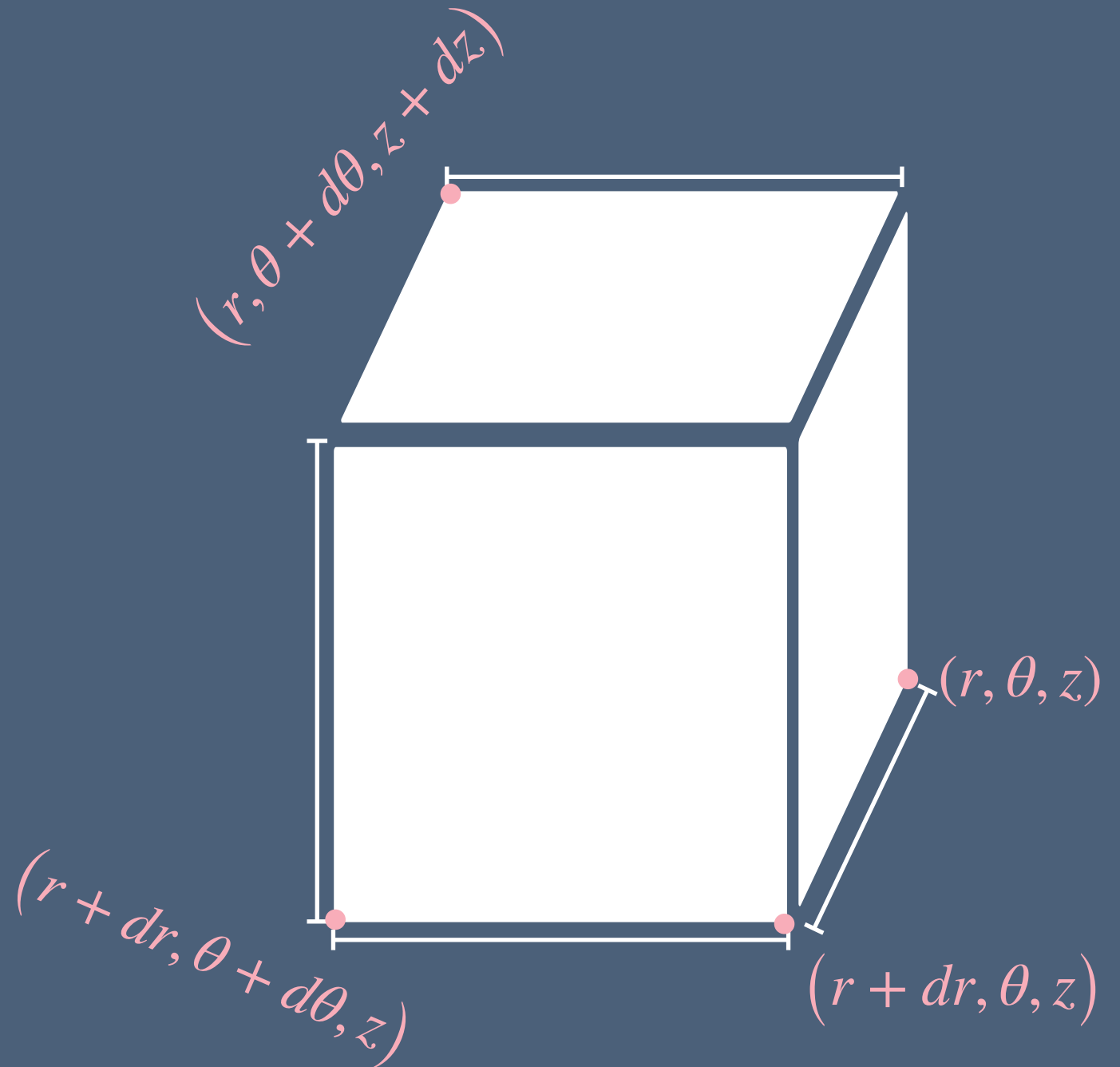 cylindrical coordinates...

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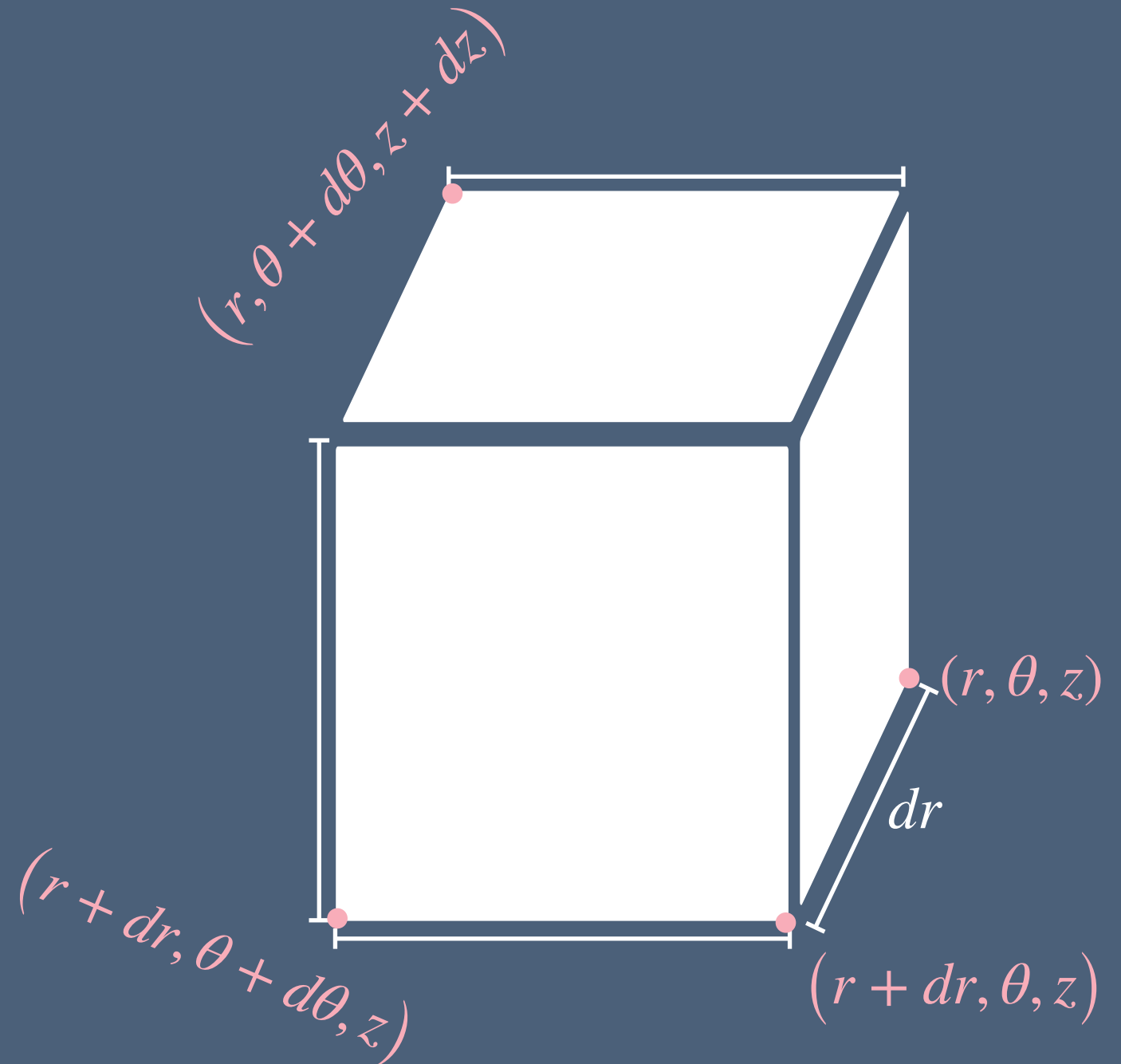 cylindrical coordinates…

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$(r, \theta + d\theta, z + dz)$

(r, θ, z)

$(r + dr, \theta + d\theta, z)$

$(r + dr, \theta, z)$

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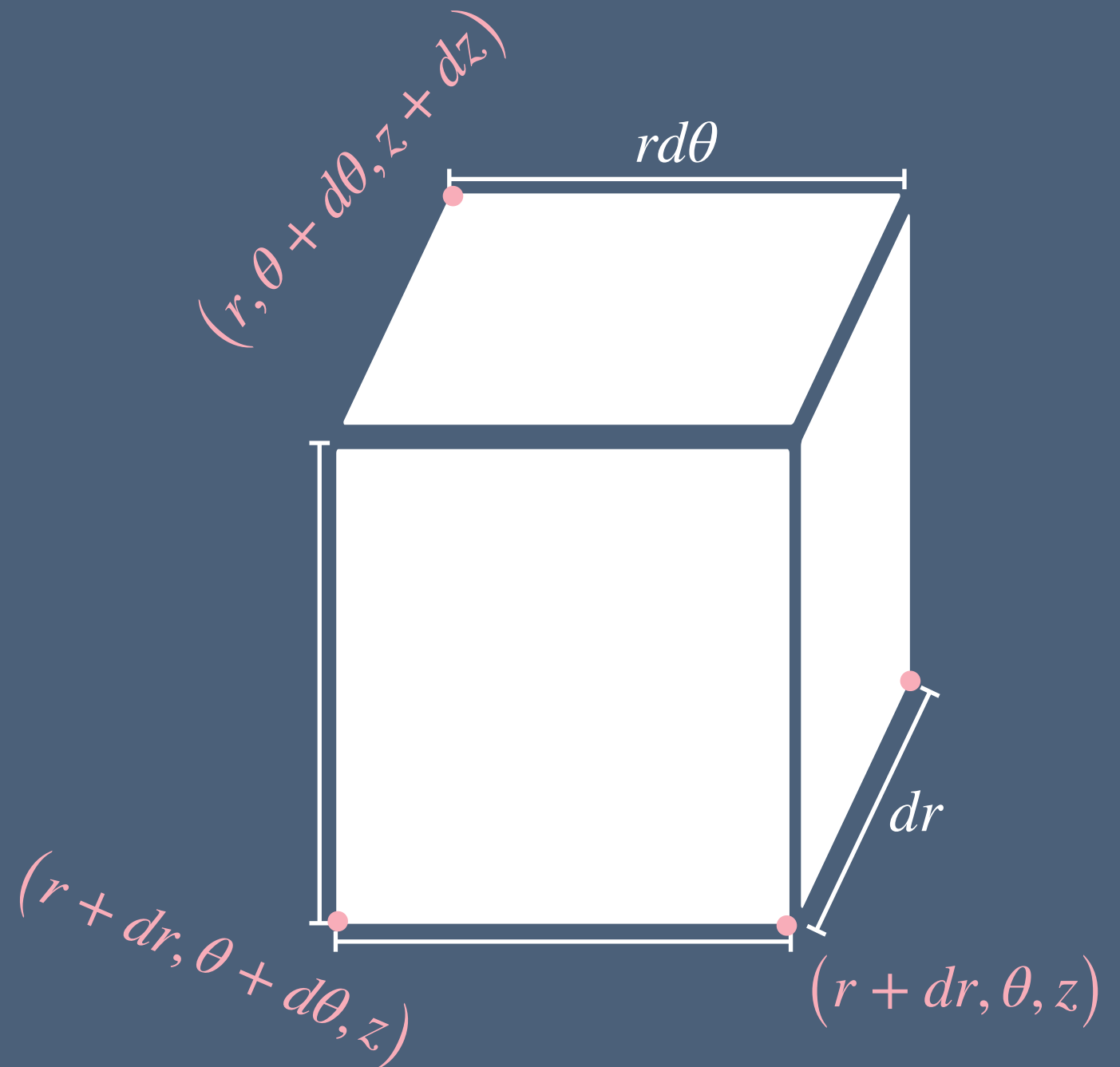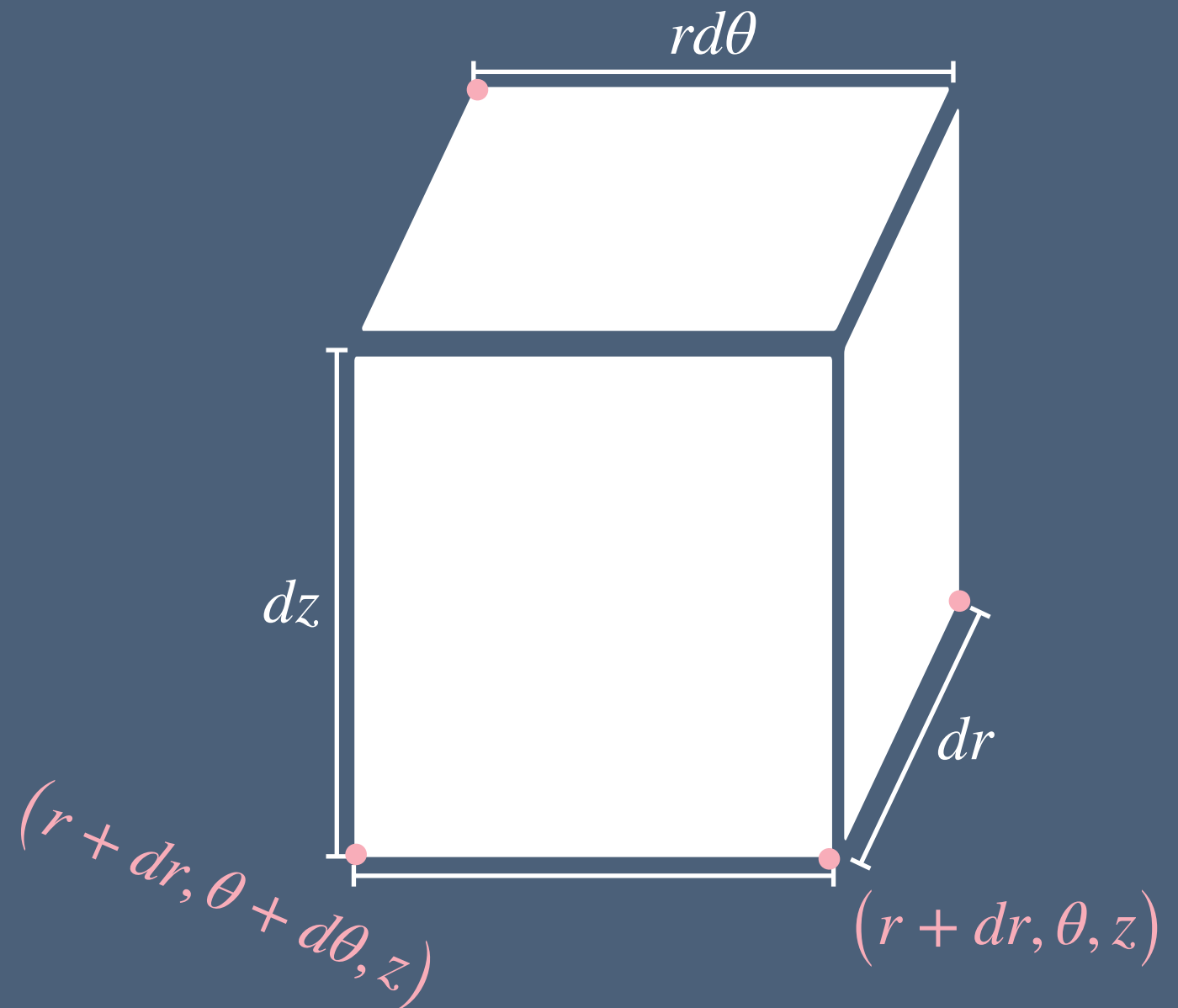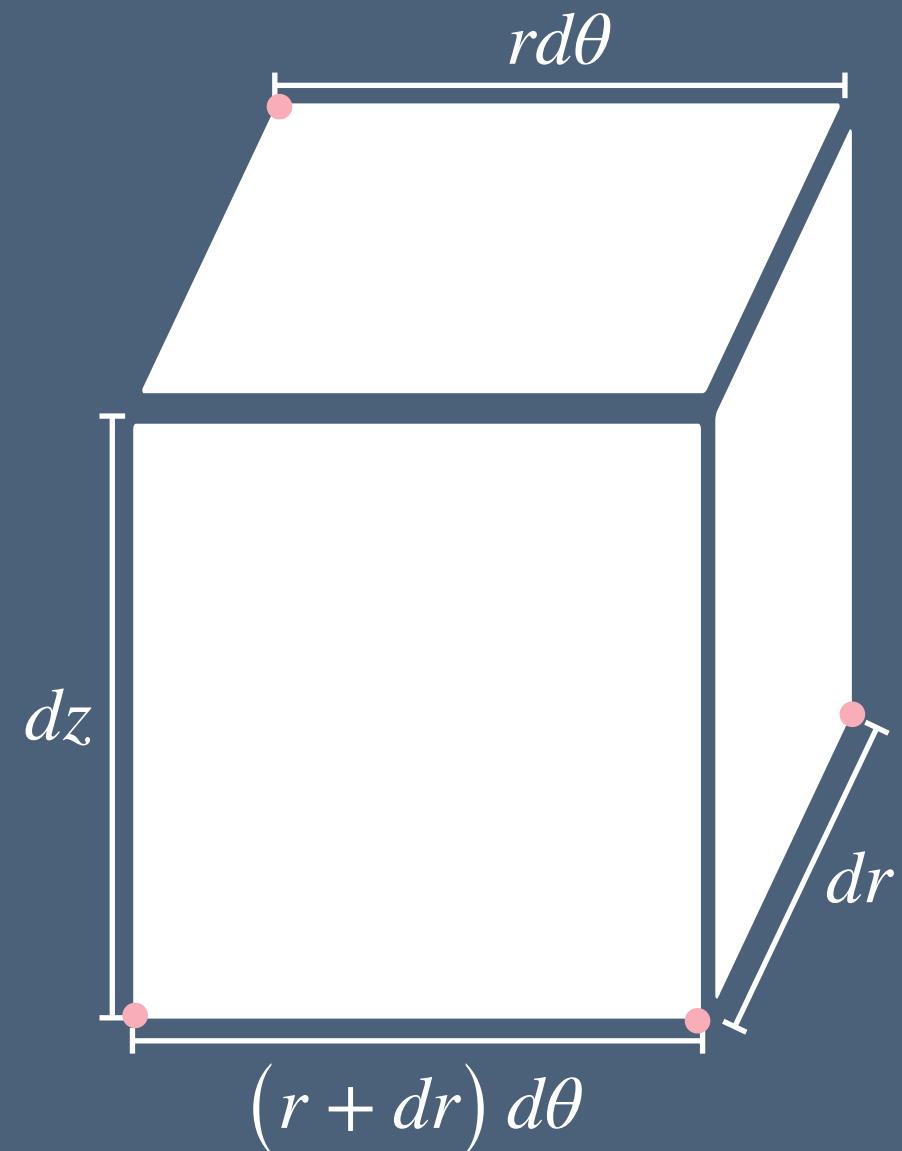 cylindrical coordinates...

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$rd\theta$

dz

dr

$(r+dr, \theta+d\theta, z)$

$(r+dr, \theta, z)$

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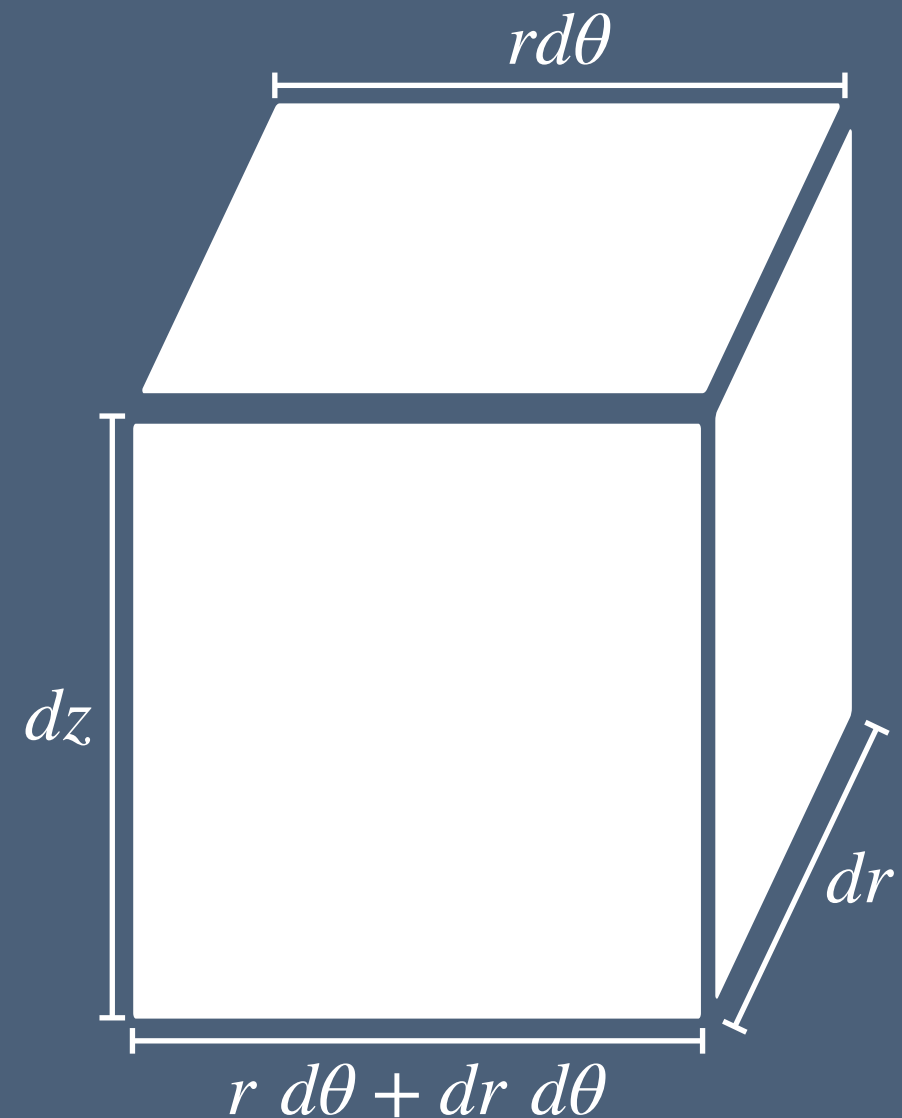 $dV = r\, dr\, d\theta\, dz$ in
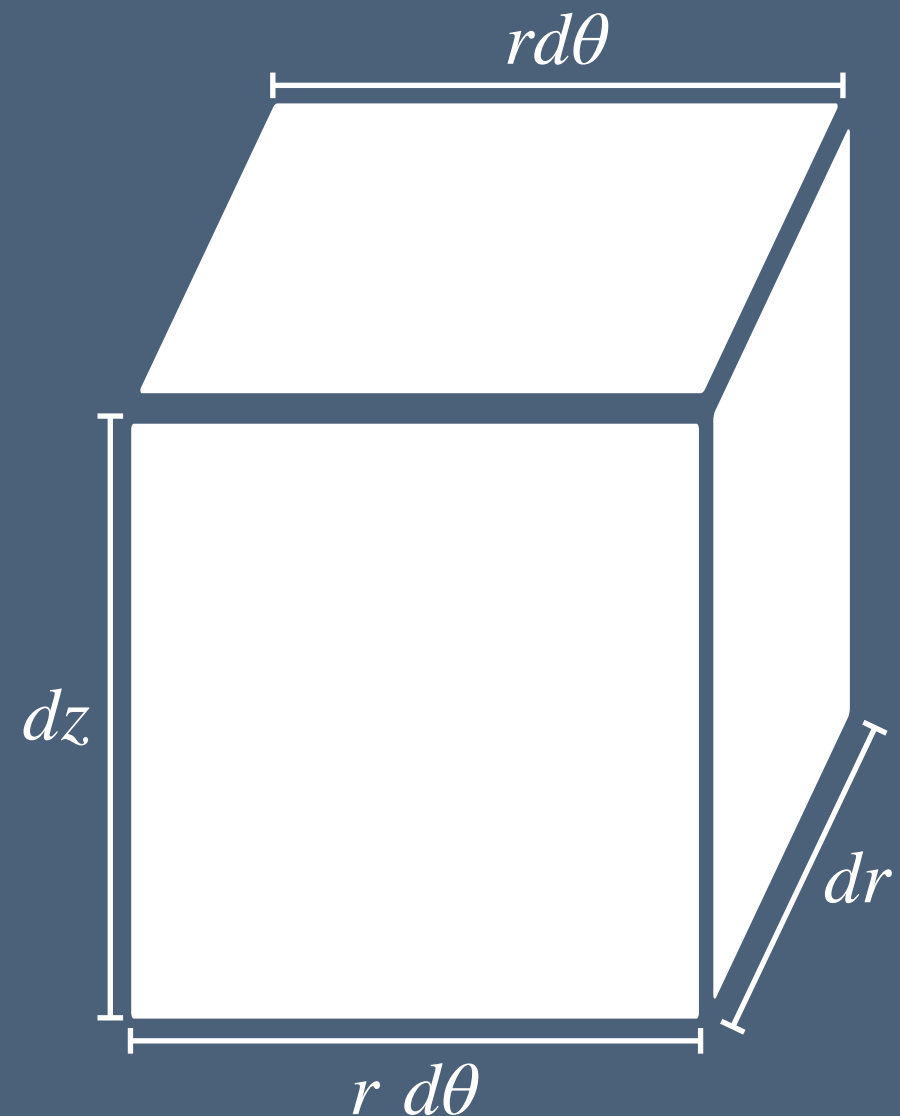 cylindrical coordinates...

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cylindrical coordinates…

$rd\theta$

dz

dr

$r\ d\theta$

Problems for the week

Tuesday:

- 3.5

- 3.10

- 3.22

Thursday

- 3.26 — lays the groundwork for orbital mechanics!

  Be rigorous! You have everything you need to prove each part in a few lines!

- 3.30 — Moments of inertia refresher

  Taylor's notation for cylindrical coordinates (ρ instead of r) is annoying - sorry!