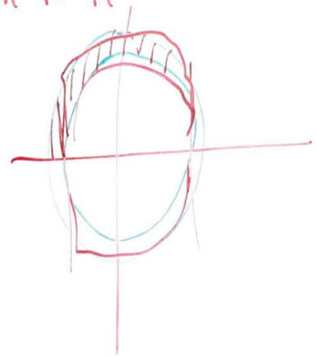
Good	What the $\int$
evaluating $\iiint$ notebook	Visualizing Solids
↳ parameters are whack	$\boxed{\text{Changing bounds in 3D}}$
evaluating partial derivatives	$\iiint$ in general.
5, 6	12b
dogs r good	10b
yay extra time	9

$$\iiint \underbrace{\text{density Fe}}_{\frac{kg}{m^3}} \; \underset{m}{dx}\,\underset{m}{dy}\,\underset{m}{dz}$$



$$\text{human population} = \int_{t_{past}}^{t_{now}} \text{change in pop } dt$$

line

$$n = \iint_{lat_1,\, long_1}^{lat_2,\, long_2} \text{function that gives you height of Earth at } (x,y)\; dx\, dy$$

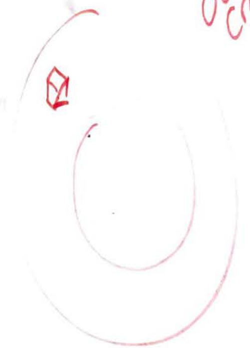
$$h = \int_{I_1}^{I_2} \text{current through capacitor } dC = Q_{cap}$$

$$\int_R \rho \, dV$$

DENSITY

DIFF VOL EL

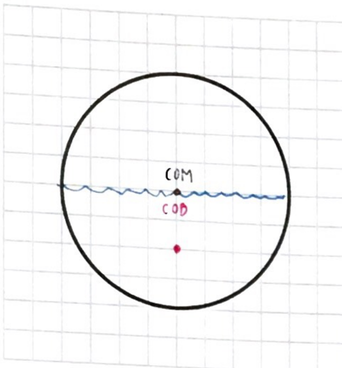
SHELL OF OUTER CRUST

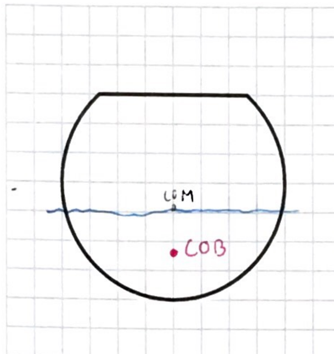


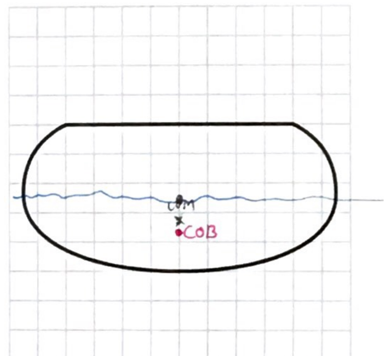
Katie Mellie
(she/her)
Deborah Magal

Katie, Deborah, Mellie, Maalvika

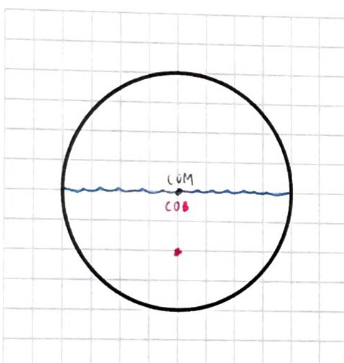
0 degrees of heel

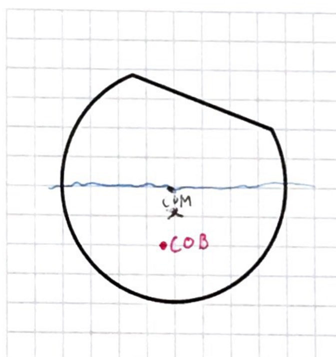


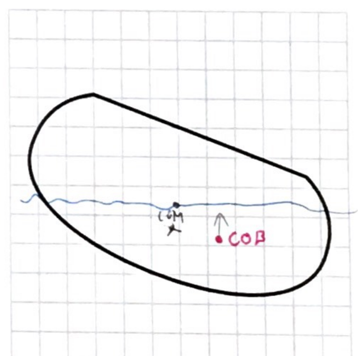




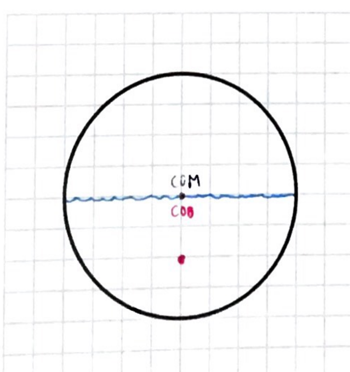
20 degrees of heel

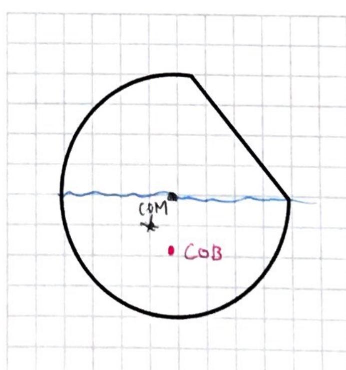


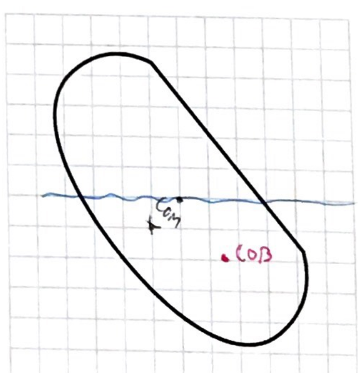




50 degrees of heel

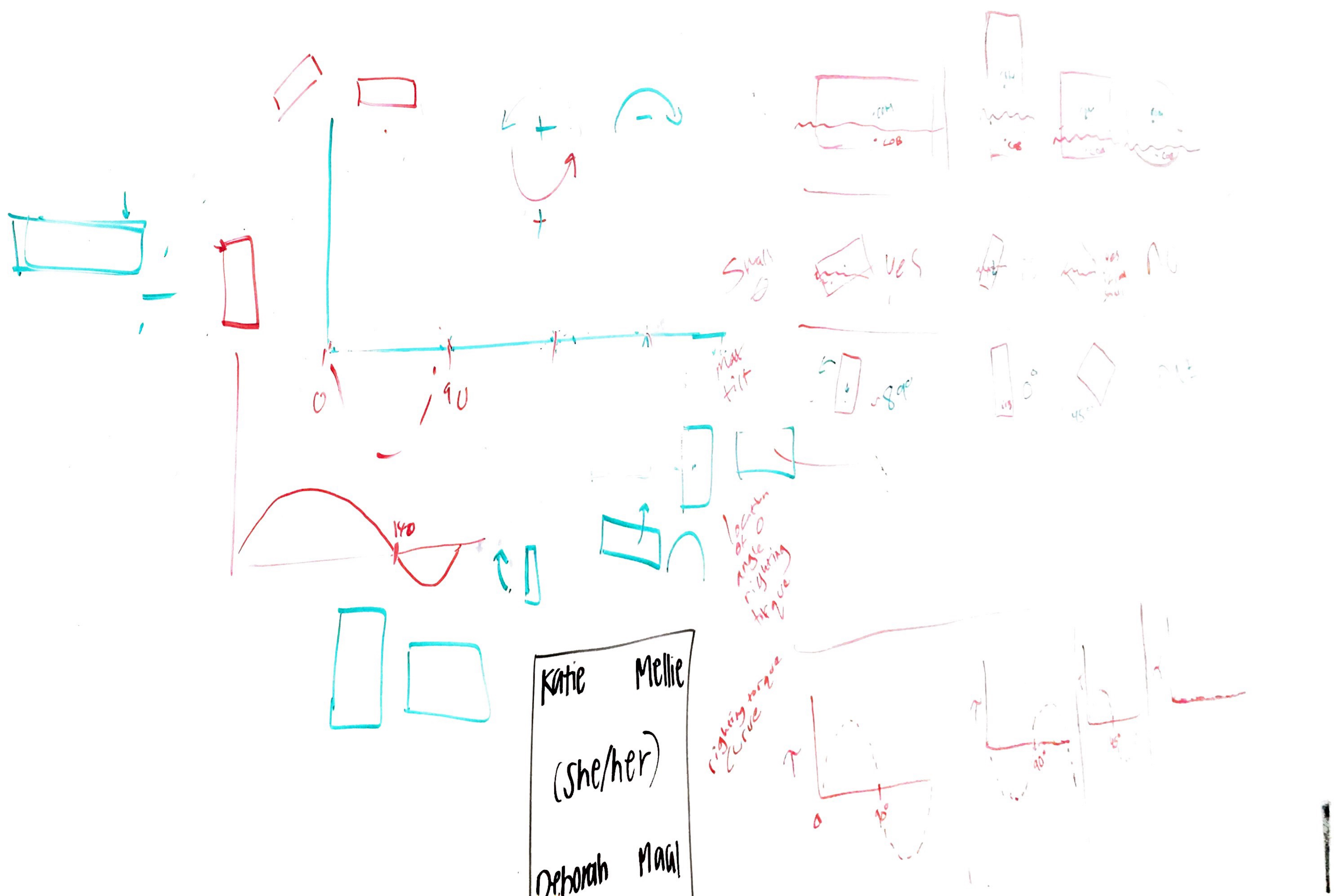






Indicate locations of COM, COB, and waterline for three different cases:

- Case 1: Wooden dowels, density = 0.5 density of water.
- Case 2: Wooden dowels, with additional point mass attached at bottom of hull.



Katie Mellie

(she/her)

Deborah Magal

12) - Heel angle, density of boat, Shape of boat

- Calculate CoM
  - estimate shape of boat w/equations
  - use equations to do bounds of integrals
  - integral for mass
  - integrals for xCOM & yCOM / mass

$M = \iint_R \rho \, dA$

- Calculate waterline
  - density water / density boat ≈ estimate placement

$M_B == \iint_{R(d)} \rho \, dA$

- Use waterline to calc-late CoB
  - use integral with waterline d (from last class) to estimate area under water
  - integral for mass under water
  - integrals for xcom & ycom under water / mass under water

- Use CoM & CoB to calculate righting moment
  - find "r" moment arm between CoB & CoM
  - calculate torque with CoM · r & CoB · r

FIND d st. $M_B = M_W$

SOLVE $M_W = \iint_{R(d)} \rho \, dA$

$M_B == \iint_{R(d)} \rho \, dA$

Katie Mellie

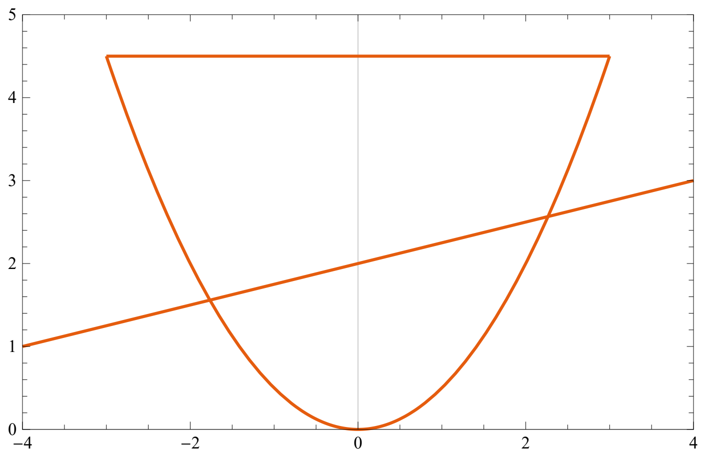
(she/her)

Deborah Magi

Day 5 Boat Calculations

```
f = (x^2) / 2
```

In[313]:=
```
Show[Plot[(x^2) / 2, {x, -3, 3}, PlotRange → {{-4, 4}, {0, 5}}, PlotTheme → "Scientific"],
 Plot[2 + 0.25 * x, {x, -4, 4}, PlotRange → {{-4, 4}, {0, 5}}, PlotTheme → "Scientific"],
 Plot[4.5, {x, -3, 3}, PlotRange → {{-4, 4}, {0, 5}}, PlotTheme → "Scientific"]]
```

Out[313]=


N[Integrate[Integrate[density in kg/m^3, {y because dy, (equation of boat is bottom limit, top limit aka height of boat)}], {x because dx, bottom x limit, top x limit}]]

In[319]:=
```
N[Integrate[Integrate[100, {y, (x^2) / 2, 4.5} ], {x, -3, 3}]]
```

Out[319]= 1800.

N[(1/mass from last cell)*Integrate[Integrate[density*y,{y because dy, equation of hull is bottom limit, height of boat}], {x because dx, left x limit, right x limit }

In[320]:=
```
N[(1 / %) * Integrate[Integrate[100 * y, {y, (x^2) / 2, 4.5} ], {x, -3, 3}]]
```

Out[320]= 2.7

In[321]:=
```
Show[Plot[((x^2) / 2), {x, -3, 3},
  PlotRange → {{-3, 3}, {0, 4.5}}, PlotTheme → "Scientific"],
 Plot[%, {x, -3, 3}, PlotRange → {{-3, 3}, {0, 4.5}}, PlotTheme → "Scientific"] ]
```

Out[321]=