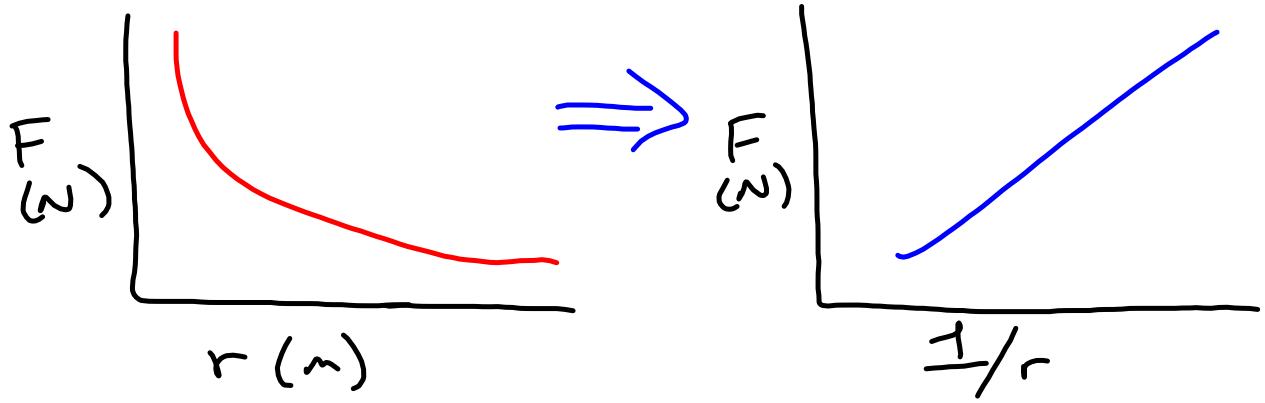
# LAB — ROTATIONAL STATICS

- Find the relationship between the force to hold the hanging mass and the position from the rotation point.

- Whiteboard:
  - Data
  - Graph → $\bar{F}$ vs. $\bar{r}$
  - Interpretation




- Linearization is changing what we are plotting.

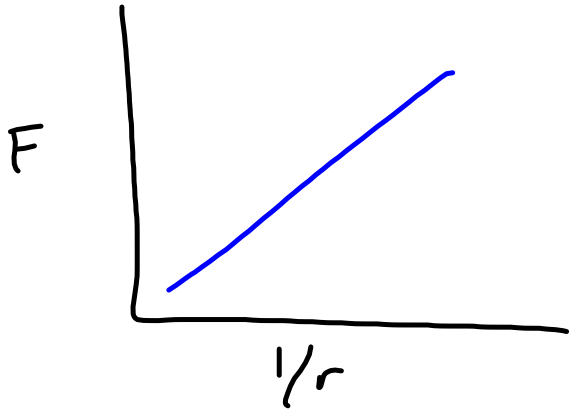
| r (m) | F (N) | $\frac{1}{r}$ |
|---|---|---|
| | | |

- Start with the simplest way to linearize → $x^0, x^1, x^2, \ldots$

$\frac{1}{x^1}, \frac{1}{x^2}$

$e^x, e^{-x}$

$\ln(x), \ln(-x)$




$$\text{slope} = \frac{F}{1/r}$$

$$= Fr$$

name for the slope is torque!

$$\vec{\tau} = \vec{r} \times \vec{F}$$

lowercase Greek "tau"

cross product

- Torque:

$$\vec{\tau} = \vec{r} \times \vec{F}$$

$$|\vec{\tau}| = |\vec{r}||\vec{F}| \sin\theta$$

- often give direction a clockwise (cw) or counterclockwise (ccw)

- Units: $N \cdot m$

- Rotational Statics → $\sum \bar{\tau} = \emptyset$
- Rotational Dynamics → $\sum \bar{\tau} = I\bar{\alpha}$