Anatomy of a Field Trip - Examples and details
First we generate a class announcement, which includes driving directions. Students are responsible for their own transportation.
The heart of each trip is a presentation by a scientist or engineer on the role of calculus in the work they do.
Sample slides from various presentations.

If $y_{err} > -\left(1/2\gamma \right) \left( \frac{dy_{err}}{dt} \right)^2 + y_{eb}$ then $F_{control} = -F^*$
Sample slides from various presentations.

### Aerial Structure – Support Motion

**Support Motion**

\[ F_{\text{spring}} = ku \]
\[ F_{\text{damper}} = c\dot{u} \]
\[ F_{\text{inertia}} = m(\ddot{u} + \ddot{u}_g) \quad \text{Absolute acceleration} \]
\[ F_{\text{external}} = 0 \]

\[ m(\ddot{u} + \ddot{u}_g) + c\dot{u} + ku = 0 \]

\[ m\ddot{u} + c\dot{u} + ku = -m\ddot{u}_g \quad \text{Like applied force f(t)} \]
Sample slides from various presentations.

Understanding Bank Portfolio Credit Risk (σ) and Return (μ)

Bank Portfolio Value depends on the Credit Quality of Borrowers that the Bank has lent to.

Uncertainty in Borrower’s Future Credit Quality leads to Uncertainty in Bank’s Future Portfolio Value.

\[ \sigma = \text{Standard Deviation of Future Portfolio Values} = \text{Portfolio Risk} \]

Borrowers (creditors) can Default on the Bank Loans causing Loss to the Portfolio Value. This is Portfolio Credit Risk.

\[ \mu = \text{Expected Portfolio Return (}$) = \text{Expected Growth in Portfolio Value} \]

Bank Mandate

Allocate (Invest) Equity Capital to Maximize Bank Portfolio’s Expected Return / Risk aka Portfolio Sharpe Ratio (Sp):

\[ \text{Maximize: } \frac{\mu}{\sigma} \]
Sample slides from various presentations.

Dose response alignment

Yeast mating pheromone signaling pathway

We observe dose-response alignment at many stages.

Why? How?
Sample slides from various presentations.

**Engine, work & power**

- **Horsepower curve**
- Peak
- Area under the curve = total work done.
- To maximize acceleration (and efficiency) run the engine as much as possible in this range.
The best field trips have a hands-on component.
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In addition, many of our hosts will also talk about their career path.
And sometimes give a tour of the company.
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And sometimes give a tour of the company.
To give the students direct experience with the topics, the instructor designs a followup project, using actual data from the company whenever possible.
In the end, we hope we have shed a little light on our students’ world.