MATH 152–CALCULUS I: WELCOME!

Dr. Mike Janssen

January 15, 2021

ABOUT DR. JANSSEN

- Year 7 (!!) at Dordt
- Alma maters: South Dakota (’07), Nebraska (’09, ’13)
- Enjoys: running, board games, fermentation

Lila (age 4)

Sam (age 1)

AGENDA

Syllabus exploration

Expectations and Q&A

The Big Idea of Calculus

Average Velocity

Course Intro and Syllabus Exploration

ACTIVITY: SCAVENGER HUNT

- Go to `student.desmos.com`
- Type in the class code:

  `MYH RR5`

- Create an account to sign in (this will be required for the preview activities!)

Highlights

ALEKS (I KNOW YOU'RE SICK OF THIS)

- Required score: 70 or better, by Monday
- Not meeting this requirement could significantly disrupt your four-year plan

REQUIRED MATERIALS

- Access to Canvas/Active Calculus/Edfinity
- Calculus Bundle from Campus Store

GRADING

- Focus on mastery, not just getting things partly right
- Engagement Points: points for being a good citizen of the class
- Mastery-based exams/quizzes
- We'll talk more about it as it becomes relevant

STUDENT HOURS APPOINTMENTS

- "*Student* Hours" are **your** time!
- Preferred method: make an appointment at `https://calendly.com/mkjanssen`
- Appointments are **not** required
- Drop in if my door is open!

Expectations

PREPARING FOR CLASS

- Look at each week's Canvas homepage by Monday and note upcoming deadlines
- Buy the calculus bundle and do the prep assignments
- If you have a virtual accommodation, prepare to participate asynchronously after class.
- Take care of yourself so you can actively engage in the class

IN CLASS/PARTICIPATING REMOTELY

- Wear a mask that covers your mouth and nose for the duration of class
- Try the activities and ask questions when you're stuck.
- Talk to your neighbors and participate!
- Use a visual cue to get attention—we can't see if you're about to say something!
- Show grace toward one another (and me!) as we navigate an occasionally strange/awkward educational environment

AFTER CLASS

- Make appointments with me! Or just drop by. I'm in SB 1612.
- Complete the homework on time.
- Upload your activities by 5pm on Fridays
- Take the exams/quizzes seriously!

COLLABORATION

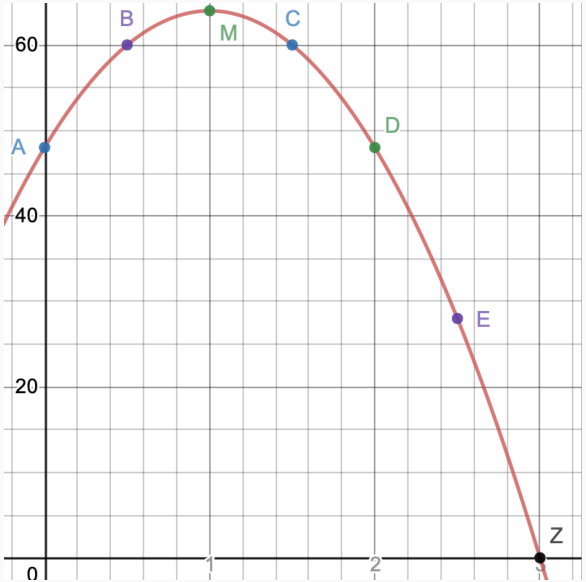
- Collaboration is encouraged!
- All work that you turn in must be your own.
- If you discuss a problem with someone at all, you should say so.

Questions?

Thinking about velocity

PREVIEW ACTIVITY 1.1.1

- Work with those nearby
- Goal: put forth a good-faith effort on each problem
- Remember that your work will be scanned and uploaded for good-faith effort by the end of the week, so take good clean notes in your workbooks


B
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2

POSITION V. VELOCITY

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- Units: t is time, $s(t)$ is distance
- Average velocity from $t = a$ to $t = b$:

$$AV_{[a,b]} = \frac{s(b) - s(a)}{b - a}$$

ACTIVITY 1.1.2

> *To shed light on any continuous shape, object, motion, process, or phenomenon—no matter how wild and complicated it may appear—reimagine it as an infinite series of simpler parts, analyze those, and then add the results back together to make sense of the original whole.*

–Steven Strogatz, *Infinite Powers*

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- Question: What can we measure in an instant (e.g., in a photograph)?
- **However:** velocity is a *rate of change*–at any given *instant*, I am not moving!
- The Infinity Principle gives us a way of approximating something like “instantaneous velocity”

...BUT WE CAN DEFINE IT ANYWAY

- The idea: to approximate instantaneous velocity at $t = a$, compute the average velocity over the interval $[a, a + h]$, where h is some arbitrarily (infinitesimally?) small number that is allowed to vary

$h < 0$?

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- That is:

$$IV_{t=a} \approx AV_{[a,a+h]} = \frac{s(a+h) - s(a)}{a+h-a} = \frac{s(a+h) - s(a)}{h}$$

EXAMPLE

In a time of t seconds, a particle moves a distance of $s(t) = 4t^2 + 3$ meters from its starting point. Find an expression for the average velocity on $[1, 1+h]$, and use it to estimate the instantaneous velocity of the particle at $t = 1$.

ACTIVITY 1.1.4

FOR NEXT TIME

- Pass the ALEKS
- Buy the calculus bundle from the campus store ($60)
- Complete the Edfinity demo assignment
- Do the Section 1.2 Prep assignment by 8am Monday
- Talk to me if you have any questions!