



Calculus 2 (1440, 1522) Prep



Drop-In Tutoring for Engineering & Computing

Get help in your core STEM courses, engineering & computing specific classes, software, and coding languages.

ESS suite (CEC 2080) & online via the Penji App (with Zoom)



Tutoring schedule & more info at
ess.unm.edu/services/tutoring/

or through our app - succESS





CENTER
FOR ACADEMIC
PROGRAM SUPPORT

caps.unm.edu



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WRITING
SCIENCE
MATH
LANGUAGES



Online Drop-in Support

Individual
Appointments

Supplemental
Instruction

Learning Strategies

Semester-Long Engagement Opportunities

Many are open to pre- and full majors and have no citizenship or GPA requirements.

<https://goto.unm.edu/mentoring>

MENTORING

- **BE a mentor**
...to our incoming students in their transition into the University of New Mexico, the university setting, and Albuquerque.
- **HAVE a mentor***
...who is a STEM Professional working in the field to build your network and receive guidance and support.

**This program is open to UNM STEM Majors. Priority is given to Freshmen and Sophomores, but all levels are encouraged to apply.*

<https://goto.unm.edu/internships>

INTERNSHIPS

Getting real-world experiences leads to your satisfaction with your undergraduate journey. Gain valuable hands-on experience while making professional connections.

These programs are only open to School of Engineering Students.

<https://goto.unm.edu/research>

RESEARCH

- **EPICS @UNM**
...to give back to the community, earn credit, and gain research experience all at the same time!
- **Student Research Experience Program**
...to get hands-on research experience to understand how your courses fit in to real-world applications.

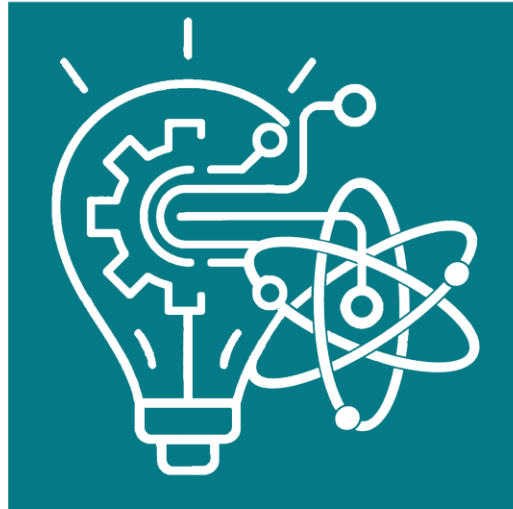
These programs are only open to School of Engineering Students.



**A tool for
engineering your**

SUCCESS

This web **APP** allows you
to keep up to date on all
we have to offer.



Put your learning into your own hands.



success.unm.edu

Includes 1-click RSVP



You are **WELCOME** to ALL events



Spring 2023 Events

We are Student Success

Pre-Semester Prep Series

Physics 1, Chem 1, Trig/Pre-Calc through Calc 3

Semester Long Programs

Mentoring, Internships, Research

Presentation Prep Series

What is a Conference?

Designing Effective Presentations

Data Visualization

Delivering Presentations

1st & 2nd Year Student Events

Building Community - Weekly focused Study Groups

How to make the most of your learning

Twitch streaming event

Study Skills

Manage Your Time

Shadow Day

CAD Basics

Coffee Hour with Faculty

How to be more assertive

UROC - Attendance Participation

Spatial Visualization Series

Recap of sessions 1 - 3 from the Fall semester

Two-Axis Rotations and Inclined Planes & Curved Surfaces

Reflection Symmetry & Write a Rule

Career and Professional Development Events

Landing an internship

So, What's Next? Start-Ups, Patents, and Publications

STEM Mixer & Find Your Pack

Interviewing Basics

Building Connections & Networking

Resumes and Cover Letters

...and industry site visits...

Lab Safety Series

Hazard Communication & Hazard Evaluation

Hierarchy of Controls & Basics of PPE

Chemical Waste Management

WIN a gift card. **GAIN** experience.

BUILD your skill set. **ENHANCE** your resume.



And more! For more details, visit:
ess.unm.edu/events OR through our web-app - success

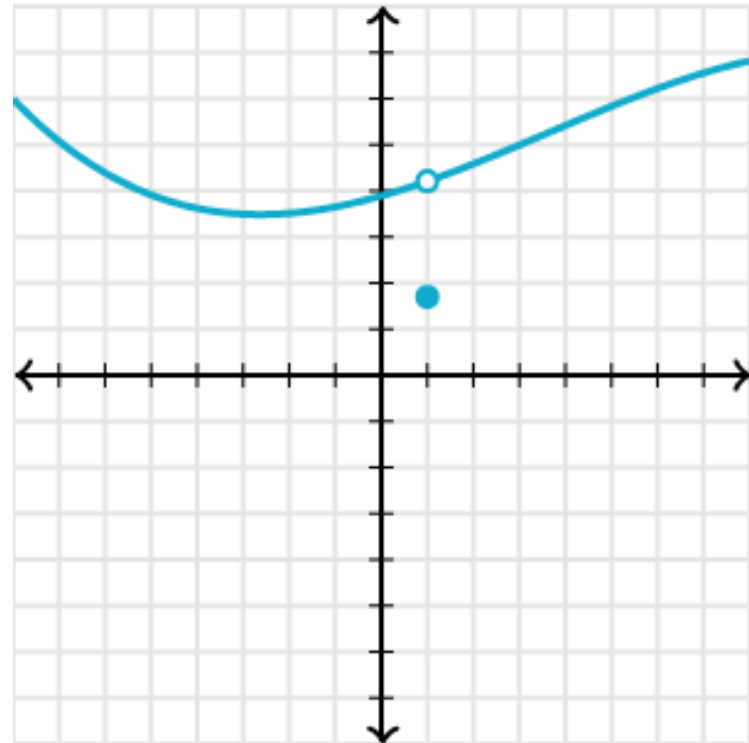


Contents

- Limits
- Derivatives
- Integrals

Limits

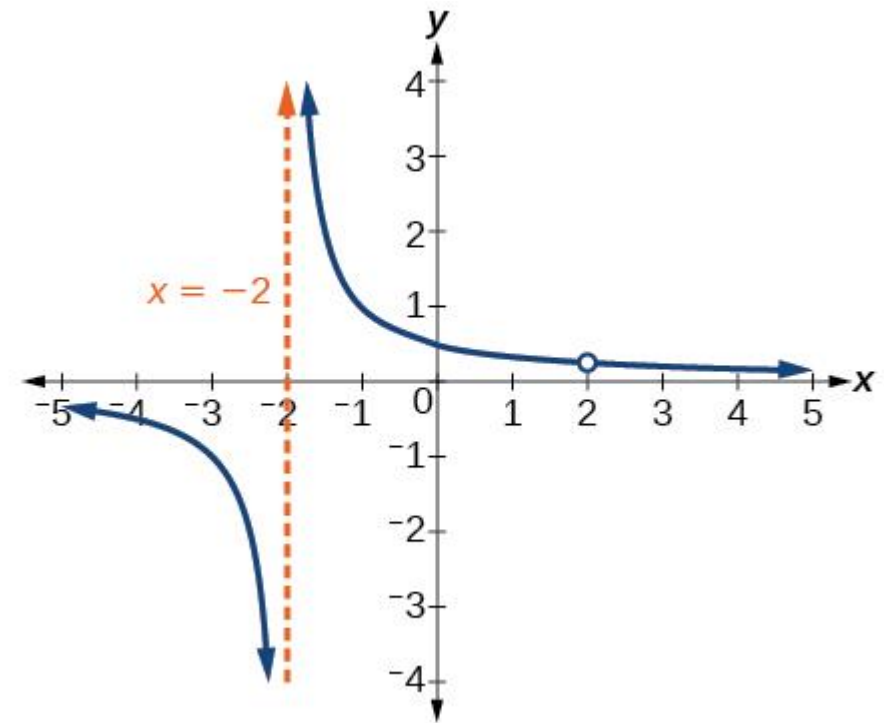
Limits tell us **the value that a function approaches** as that function's inputs get closer and closer to some number.



Asymptotes and Holes

Is the function approaching an asymptote or hole?

- Asymptote: $\lim_{x \rightarrow a^\pm} f(x) = \pm\infty$
- Hole: $\lim_{x \rightarrow a} f(x) = b$ but $f(a) \neq b$



Find asymptotes / holes and continuity

$$f(x) = |2x + 2|$$

Find asymptotes / holes and continuity

$$g(x) = \frac{x}{x^2 - 25}$$

L'Hopital's Rule

If: $\lim_{x \rightarrow a}$ results in $\frac{0}{0}$ or $\frac{\infty}{\infty}$

Then apply L'Hopital's Rule:

$$\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = \lim_{x \rightarrow a} \frac{f'(x)}{g'(x)}$$

$$\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = \lim_{x \rightarrow a} \frac{f'(x)}{g'(x)}$$

$$\lim_{x \rightarrow 0} \frac{\sin(x)}{x}$$

$$\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = \lim_{x \rightarrow a} \frac{f'(x)}{g'(x)}$$

$$\lim_{x \rightarrow \infty} \frac{4x^2 + 12}{e^x}$$

Critical, Inflection Points

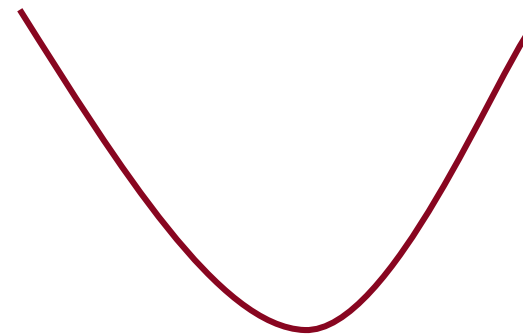
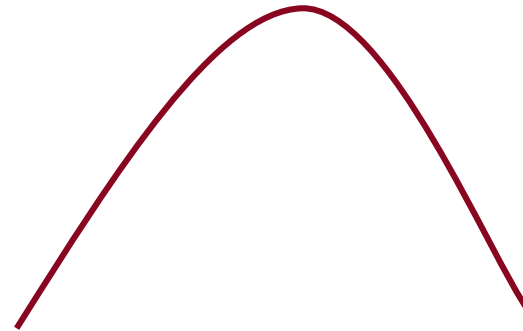
Slope:

+

-

-

+



Critical pts:

Max

Min

Inflection pts:

concave down

concave up

Find critical points, identify max and min

$$f(x) = x^3 + 3x^2 + x$$

Sketch the graph for the given function by using properties of derivatives

$$f(x) = x^3 + 3x^2 + x$$

Find find inflection points and identify areas of concavity

$$f(x) = \frac{1}{12}x^4 - \frac{7}{6}x^3 - 9x^2 + 12x + 5$$

Sketch the graph for the given function by using properties of derivatives

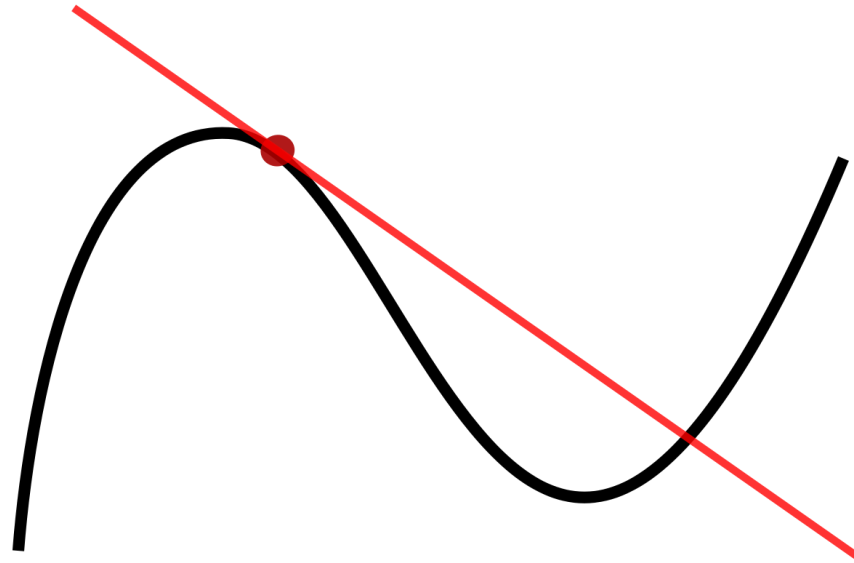
$$f(x) = \frac{1}{12}x^4 - \frac{7}{6}x^3 - 9x^2 + 12x + 5$$

Coffee BREAK



Derivatives

A measure of “slope” or the **rate of change** of a function



Power rule: $\frac{d}{dx} x^n = nx^{n-1}$

$$\frac{d}{dx} 5x^{20}$$

Product rule: $\frac{d}{dx} (f(x)g(x)) = f(x)g'(x) + f'(x)g(x)$

$$\frac{d}{dx} e^x \sin(x)$$

$$\text{Quotient: } \frac{d}{dx} \left(\frac{f(x)}{g(x)} \right) = \frac{g(x)f'(x) - f(x)g'(x)}{g(x)^2}$$

$$\frac{d}{dx} \frac{2x}{\sin(x)}$$

Chain: $\frac{d}{dx} (f(g(x))) = f'(g(x))g'(x)$

$$\frac{d}{dx} 5(x - 3)^2$$

$$\text{Chain: } \frac{d}{dx} (f(g(x))) = f'(g(x))g'(x)$$

$$\text{Quotient: } \frac{d}{dx} \left(\frac{f(x)}{g(x)} \right) = \frac{g(x)f'(x) - f(x)g'(x)}{g(x)^2}$$

$$\text{Product rule: } \frac{d}{dx} (f(x)g(x)) = f(x)g'(x) + f'(x)g(x)$$

$$\text{Power rule: } \frac{d}{dx} x^n = nx^{n-1}$$

Which rule(s) do you need to solve these ?

$$1. \frac{d}{dx} x^3$$

$$2. \frac{d}{dx} \frac{\sin(x) \cos(x)}{2x}$$

$$3. \frac{d}{dx} 2x \sin(x) \cos(x)$$

$$4. \frac{d}{dx} \left[\frac{1}{\sin(x)} + \frac{2}{\sin^2(x)} \right]$$

$$1. \frac{d}{dx} x^3$$

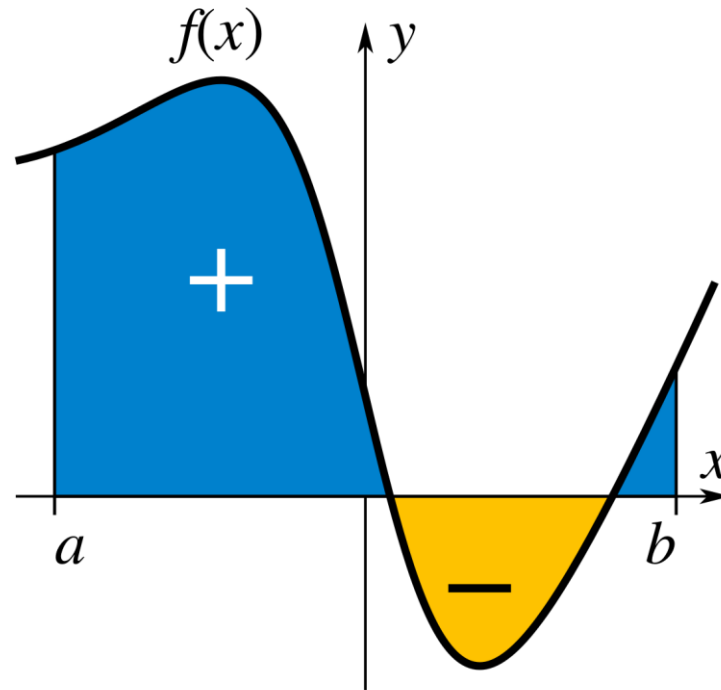
$$2. \frac{d}{dx} \frac{\sin(x) \cos(x)}{2x}$$

$$3. \frac{d}{dx} 2x \sin(x) \cos(x)$$

$$4. \frac{d}{dx} \left[\frac{1}{\sin(x)} + \frac{2}{\sin^2(x)} \right]$$

Integrals

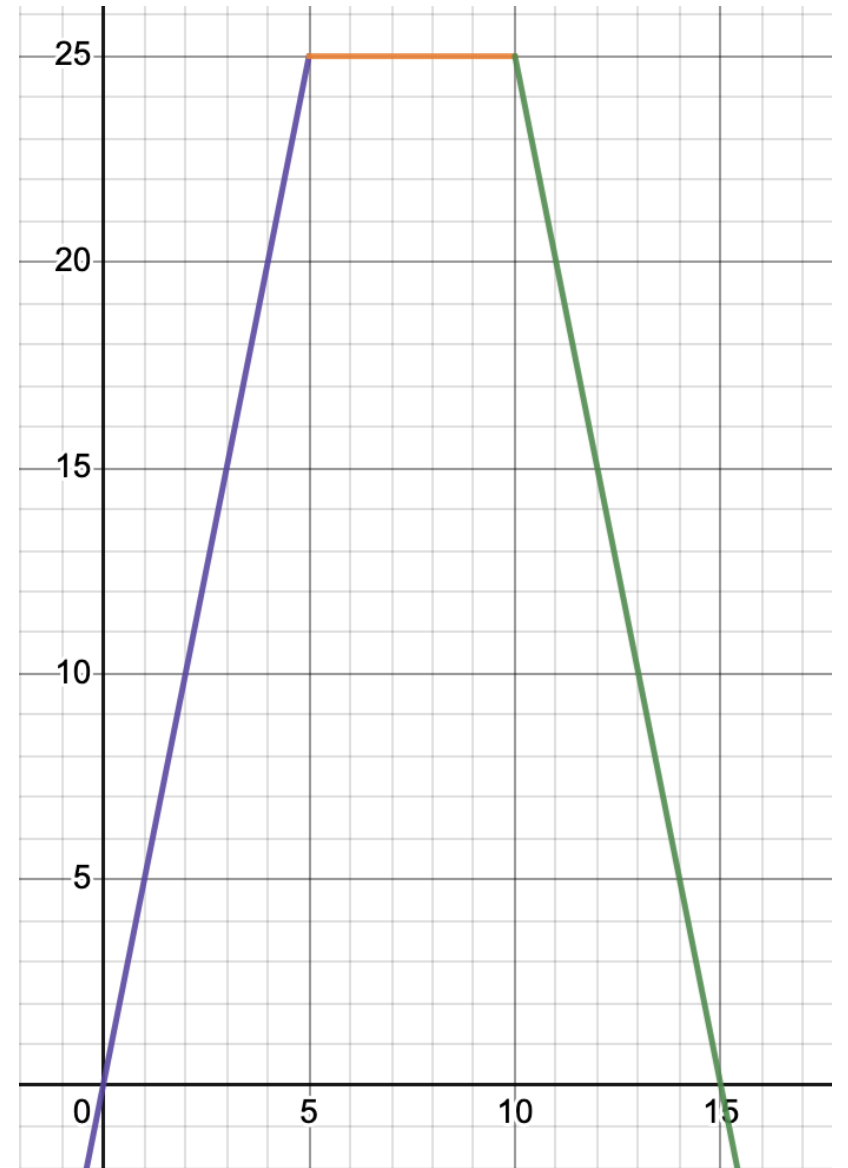
A continuous sum used to calculate **areas**



Integrate by finding area

$$f(x) = \begin{cases} 5x, & x < 5 \\ 25, & 5 \leq x < 10 \\ -5x + 75, & x \geq 10 \end{cases}$$

$$\int_0^{15} f(x) dx$$



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$$\int_0^{15} f(x) dx$$

$$f(x) = \begin{cases} 5x, & x < 5 \\ 25, & 5 \leq x < 10 \\ -5x + 75, & x \geq 10 \end{cases}$$

$$\int_0^{15} f(x) dx$$

Integrals

Can also find by taking the anti-derivative

Think of working backwards from derivative rules

Power rule: $\int x^n = \frac{1}{n+1} x^{n+1} + c$

$$\int 5x^7 + 3x^2 dx$$

U-Substitution: $\int f(g(x))g'(x)dx = \int f(u)du$, $u = g(x)$, $du = g'(x)$

$$\int 2x(x^2 + 4)^3 dx$$

U-Substitution: $\int f(g(x))g'(x)dx = \int f(u)du$, $u = g(x)$, $du = g'(x)$

$$\int \sin(x) \cos^2(x) dx$$

Second Fundamental Theorem of Calculus

$$\int_a^b f(x)dx = F(b) - F(a)$$

Use to solve **definite integrals**

2nd Fundamental theorem of Calculus: $\int_a^b f(x) dx = F(b) - F(a)$

$$\int_0^{\pi} \sin(x) dx$$

Study Tips

What you can do before the semester

| | |
|-----------|--|
| Mentality | Be proactive |
| Review | Review the self-evaluation |
| Explore | Explore online resources |
| Converse | Talk to your professor and TA |
| Locate | Find resources on campus, such as CTL and tutoring |
| Study | Form a study group, develop a study plan |

Throughout the semester



GO TO CLASS



STAY ON TOP OF HOMEWORK



GO TO PROFESSOR AND TA
OFFICE HOURS, CTL, CALC
TABLE.

Start Your Semester Off Right

Join us for a **FREE**

Pre-Semester Prep Workshop Series

These interactive workshops will review all foundational material leading up to the specified course so you are better equipped to hit the ground running.

Synchronous in-person in the ESS suite
& virtual via Zoom

| | | |
|-----------------------------|----------------------------|---------------|
| *Pre-Calc/Trig Prep | Monday, August 14, 2023 | 10 AM - 12 PM |
| *Calc 1 Prep | Tuesday, August 15, 2023 | 10 AM - 12 PM |
| *Calc 2 Prep | Wednesday, August 16, 2023 | 10 AM - 12 PM |
| Calc 3 Prep | Thursday, August 17, 2023 | 10 AM - 12 PM |
| <i>Math working session</i> | Thursday, August 17, 2023 | 1 - 3 PM |
| *Physics 1 Prep | Friday, August 18, 2023 | 10 AM - 12 PM |
| Chem 1 Prep | Friday, August 18, 2023 | 1 - 3 PM |

*Attend these sessions & give feedback for access to a general knowledge exam.

RSVP is preferred but not required

ess.unm.edu/events > August

or through our web-app - **success**



Questions?

Give
feedback.

Win a gift
certificate!



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ess.unm.edu

Don't forget to follow up on social media.

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