THE UNIVERSITY OF NEW MEXICO®

# Trig and Pre-Calc (1230,1240,1250) Prep

ENGINEERING STUDENT SUCCESS CENTER

@UNMESSCENTER

# 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.*

ENGINEERING STUDENT SUCCESS CENTER

**For more information, or to apply, visit:**
**https://ess.unm.edu/programs/current-students**

# Contents

- Functions and their Graphs
- Piecewise Functions
- Composition of Functions
- Inverse Functions
- Systems of Equations
- Simplifying Radicals

# Functions and Their Graphs

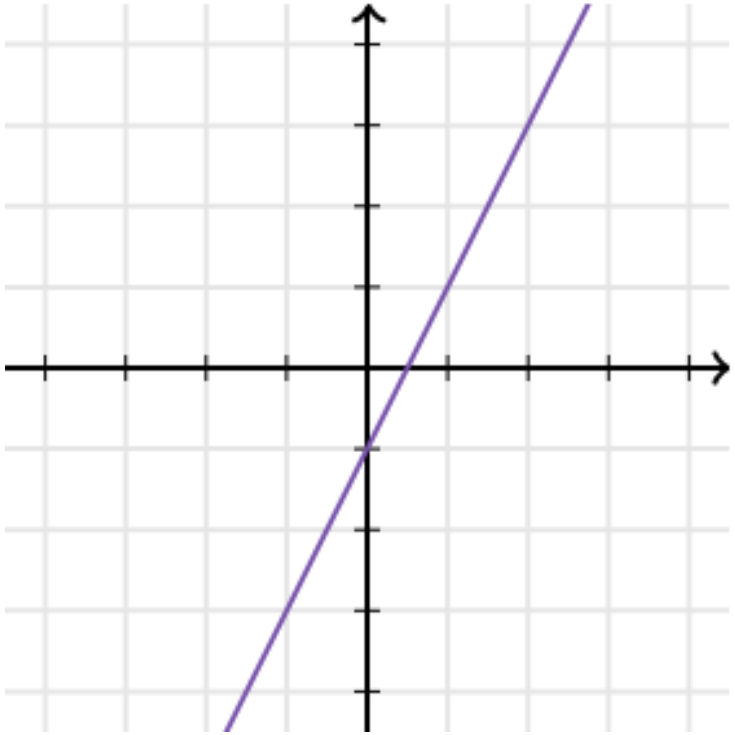
- "Parent Functions"
- Changes to the parent functions creates different looking graphs

- Important info about graphs can be obtained from functions
  - X and Y Intercepts
  - Domain and Range
  - Asymptotes and Holes
  - End behavior

# Linear Functions

- Parent function: $y = x$
- $y = mx + b$
  - m = slope
  - b = y-intercept

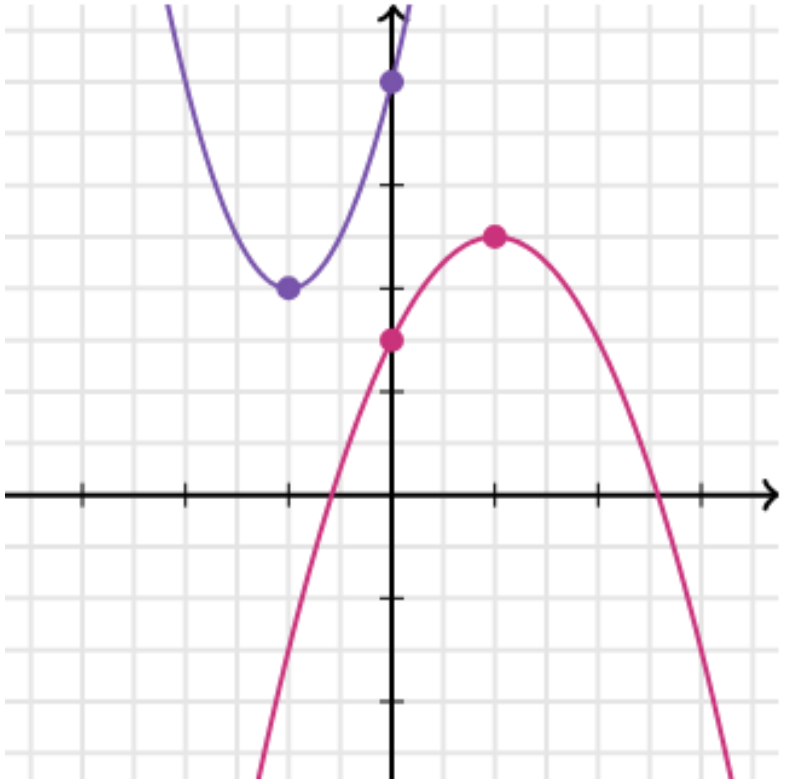
  - We can also solve for the x intercept
  - Domain and range are $(-\infty, \infty)$



# Parabolic Functions

- Parent function: $y = x^2$
- $y = Ax^2 + Bx + C$ OR $y = A(x - h) + k$
  - $(h, k)$ = vertex
  - $C$ = y-intercept

  - Factor or use quadratic formula to find x-intercepts
  - Domain is $(-\infty, \infty)$, range is based on the vertex



# Parabolic Functions

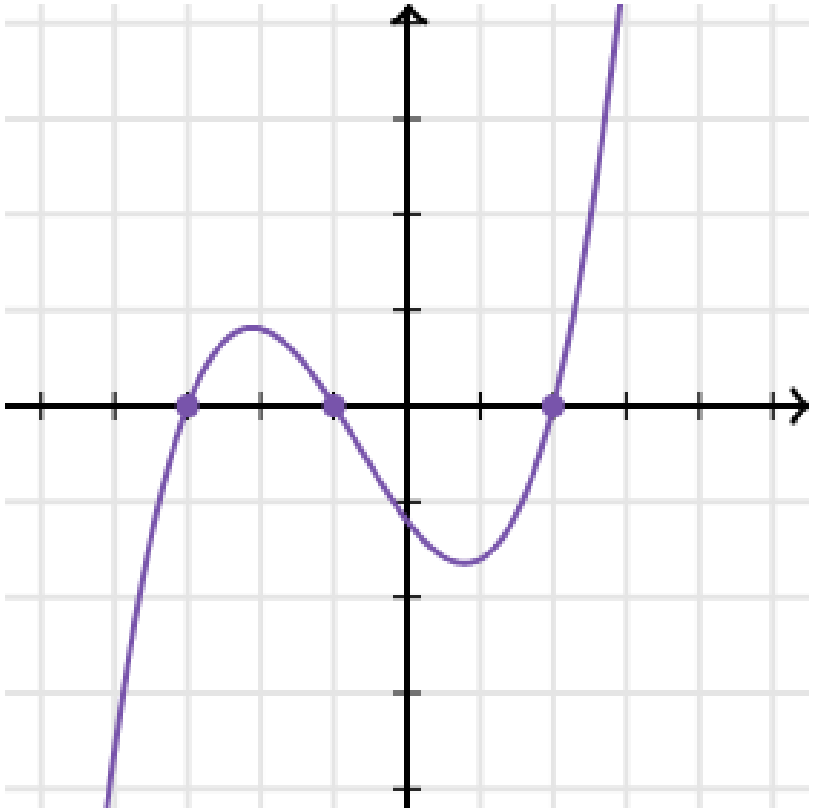
Find domain, range, x and y int's, and vertex

$y = x^2 + 2x + 1$

$$y = x^2 + 2x + 1$$

# Cubic Functions

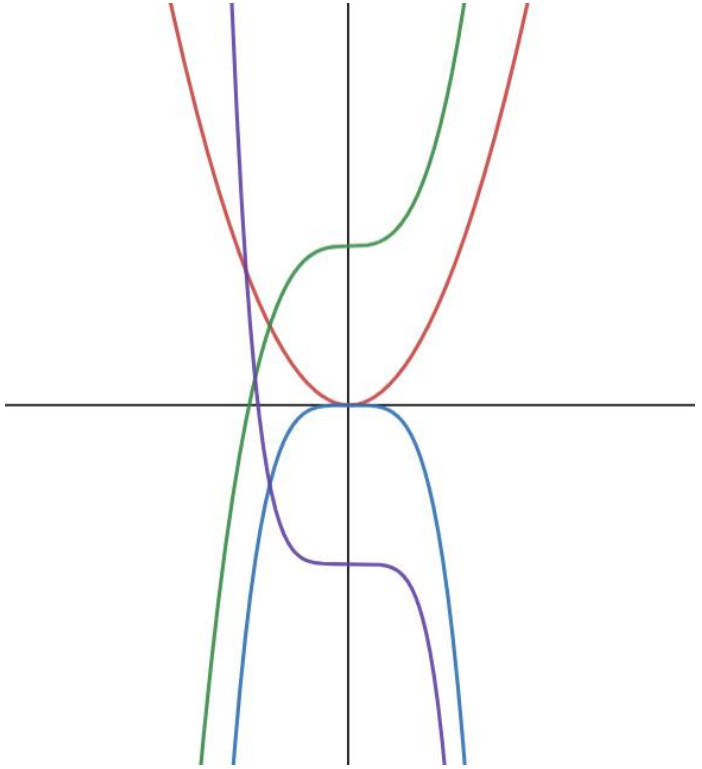
- Parent function: $y = x^3$
- $y = Ax^3 + Bx^2 + Cx + D$
  - $D$ = y-intercept
  - Factoring!!! To find x-intercept
  - Domain and range are both $(-\infty, \infty)$



# Higher Degree Polynomial Functions

Look at **degree** and **leading coefficient** to determine shape of the function

1. Odd degree, pos LC
2. Even degree, pos LC
3. Odd degree, neg LC
4. Even degree, neg LC



# Higher Degree Polynomial Functions

Look at **degree** and **leading coefficient** to determine shape of the function

$y = x^{12} + 2x + 1$

$y = -3x^4 + 14$

$y = \frac{1}{2}x^5$

$y = -x^{17} + x^{16} - x^{15} + \cdots + x$

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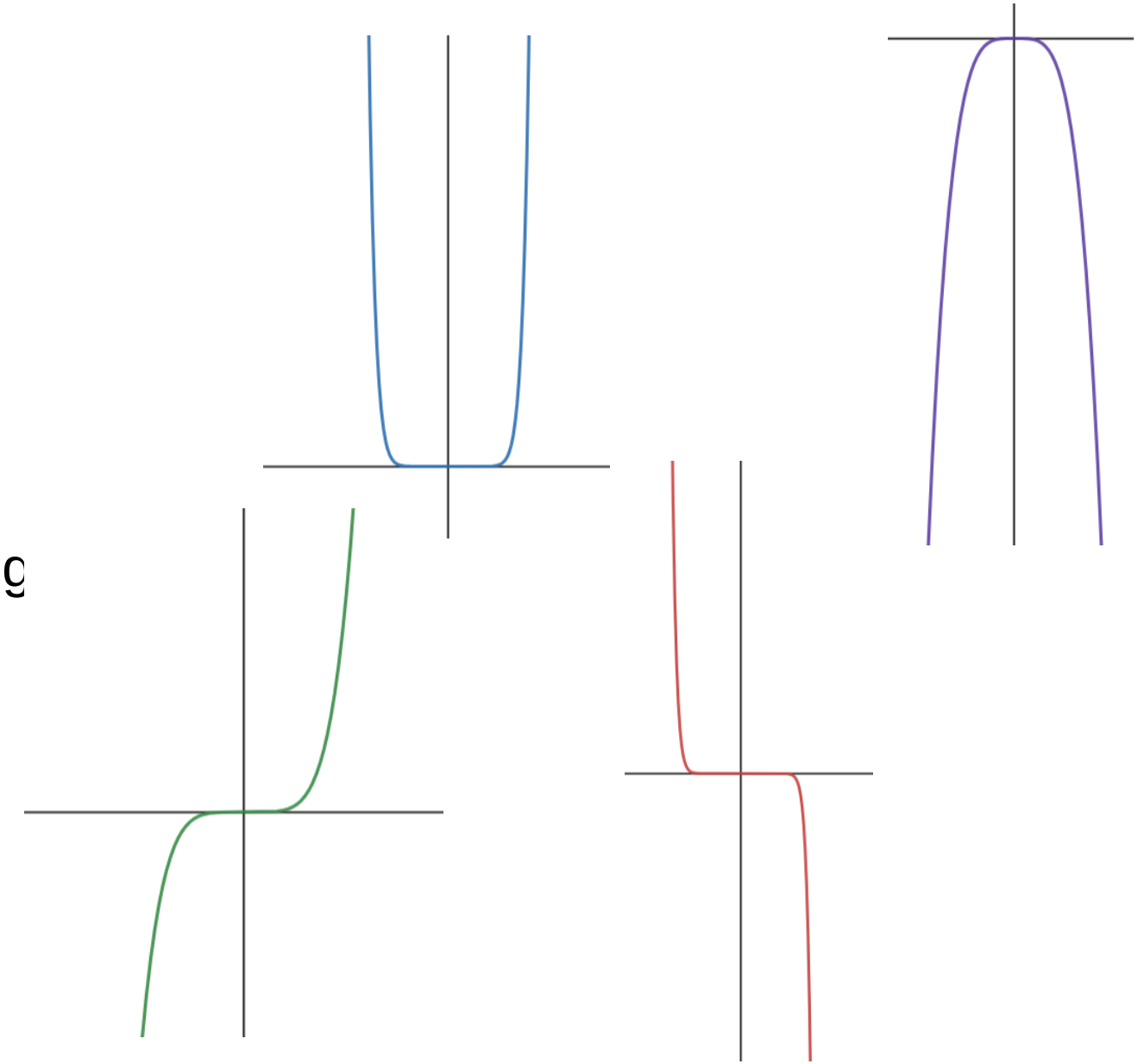
$y = x^{12} + 2x + 1$ (even, pos)

$y = -3x^4 + 14$ (even, neg)

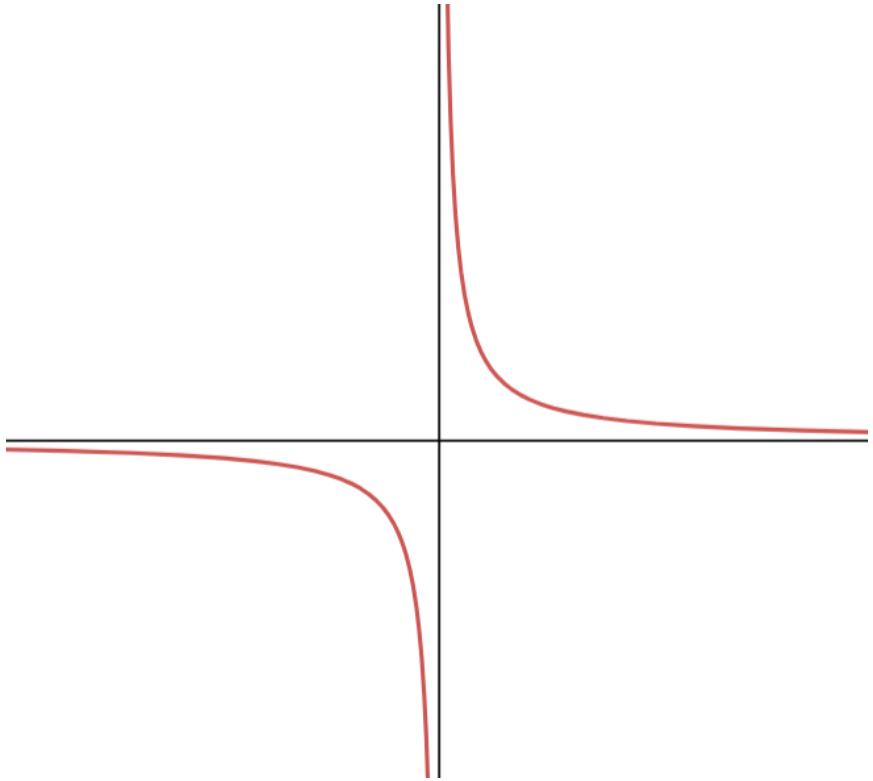
$y = \frac{1}{2}x^5$ (odd, pos)

$y = -x^{17} + x^{16} - x^{15} + \cdots + x$ (odd, neg



# Rational Functions

- A ratio (fractions) of two polynomial functions
  - Parent function: $y = \frac{1}{x}$
  - Vertical Asymptotes: set denominator equal to zero
  - Horizonal Asymptotes: Look at end behavior
    - Boss on bottom
    - Boss on top
    - Leading coefficients
  - Holes: $\frac{0}{0}$ when x=0
  - Domain and range come from asymptotes/holes



# Rational Functions

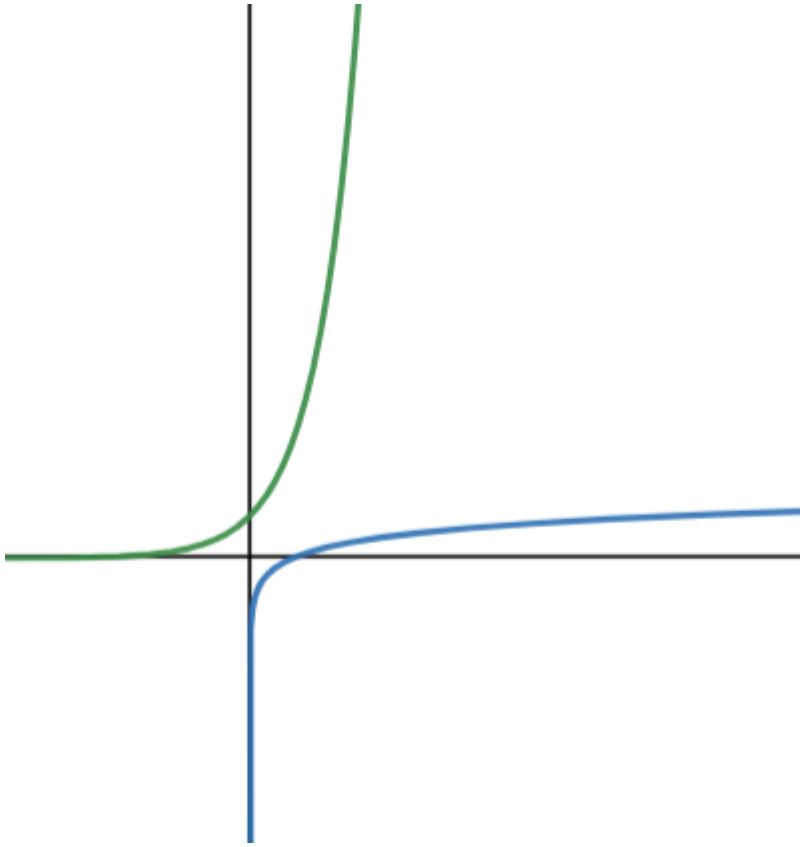
Find x and y int's, HA, VA, holes, domain, and range

$$y = \frac{x^2 + 3x}{x^2 - x}$$

$$y = \frac{x^2 + 3x}{x^2 - x}$$

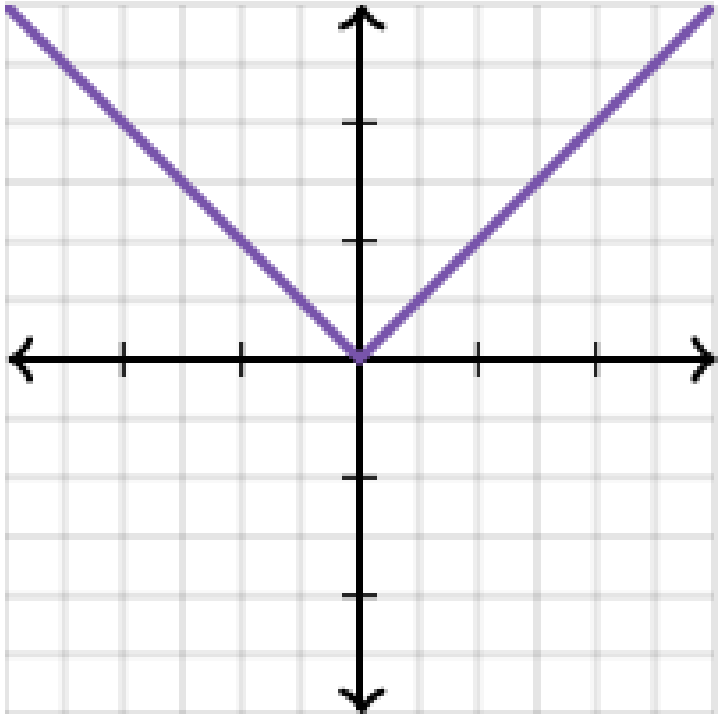
# Exponential and Logarithmic Functions

- Exponential $y = e^x$
  - Has a horizontal asymptote
- Logarithmic $y = \log(x)$
  - Has a vertical asymptote
- Inverses of each other



# Absolute Value Functions

- $y = |x|$
  - Absolute value means take the “positive part” of the number or **distance from zero**



- Think about it as a piecewise function

$$f(x) = \begin{cases} -x, & x < 0 \\ x, & x \geq 0 \end{cases}$$

# Piecewise Functions

- A function that is defined on a sequence of intervals
- Domain, range, holes, etc depend on

  what is **included in the intervals**

# Piecewise Functions

$$f(x) = \begin{cases} 2x, x < 0 \\ 1 - x, 0 < x \leq 4 \\ x^2, x > 4 \end{cases}$$

Find x and y intercepts, domain and range

Is 0 included? Is 4?

$$f(x) = \begin{cases} 2x, x < 0 \\ 1 - x, 0 < x \leq 4 \\ x^2, x > 4 \end{cases}$$

Coffee
BREAK

# Composition of Functions

- The output of one function becomes the input of another
- $f\big(g(x)\big) = (f \circ g)(x)$
  - "F **composed with** G of x"
  - "F **of** G of x"
  - Work from the inside out

# Composition of Functions

Compose the following functions as both $g \circ f$ and $f \circ g$

$f(x) = 3x + 1$ ; $g(x) = x^2 - 6$

# Inverse Functions

- A function that “undoes” the action of another function
- Domain and range is flipped from original function
- Find inverse functions by:
  - Swapping x and y
  - Solving for y

# Inverse Functions

Find the inverse of the following functions:

$f(x) = 5x + 10$

# Solving Systems of Equations

- Elimination Method
  - “Handcuff” the equations together
- Substitution Method
  - Isolate a variable in one equation and substitute it into the other
- Solutions that apply to both equations
  - Used to find where two lines intersect

# Solving Systems of Equations

Solve the following system using elimination

$$10x + 12y = -26$$
$$-6x + 6y = -24$$

# Solving Systems of Equations

Solve the following system using substitution

$x + 3y = 18$

$y = -4x + 6$

# Simplifying Radicals

- Find perfect squares within the radicals to take out
- Fractional exponents = radicals
- Note – negative exponents can be moved to the denominator

# Simplifying Radicals

$\sqrt{32}$

$2^{\frac{4}{3}}$

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

# 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.

THE UNIVERSITY OF NEW MEXICO

Engineering Student Success Center | CTL Undergraduate Support

# 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 |
| *Math working session* | 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.*

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**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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