Math 1431

Section 16679

Bekki George: rageorge@central.uh.edu

University of Houston

08/20/19

Office Hours: Tuesdays & Thursdays 11:45-1:15
(also available by appointment)
Office: 218C PGH

Course webpage: www.casa.uh.edu

About the class

All class information is found on CASA
www.casa.uh.edu

- The first portion of these materials is freely available for the first two weeks of class.
- All students must purchase a Course Access Code and enter it on CourseWare by the first day of the third week of class to continue accessing the course learning materials.
- A Course Access Code can be purchased for about $55 online.

About the class

In Class Poppers

- Daily quizzes (poppers) will be given in lectures starting the third week of class.
- You must buy popper packet from the UH Bookstore for this section.
- Bubbling another student's poppers is considered cheating.

About the class

Online Quizzes

- Online quizzes will be given on CASA starting the first day of classes.
- You may take them up to 20 times each.
- The highest score is recorded.
- They close at 11:59 pm on date listed.
- Watch for when they are to be closed, and don't wait until the last day (or minute) to complete them. The system may become overloaded and thus may prevent you from receiving credit.
- Once an online quiz closes, it will NOT reopen.

About the class

Exams

- 4 Exams and a Final Exam.
- The first exam is online and the rest of the exams will be given at the CASA testing center.
- You can schedule the time of your exam on CASA under Proctored Exams.
- The scheduler will be available two weeks prior to the exam.
- There are NO Make up Exams and there is NO Standby testing.
- Double check your date and time prior to testing. You MUST have a scheduled time.
- Plan on arriving early so if you are stuck in traffic, have overslept, or whatever, you don't miss the exam.

About the class

Grades

- Exam 1 (Online) = 3%
- Exams 2,3,4 = 15% each (45% total)
- Final Exam = 25%
- In Class Poppers/ Attendance = 4%
- Lab (recitation) grade = 15%
- Online Quizzes = 8%

About the class

Recitations/Labs

- Attendance will be taken and is mandatory!
- Written homeworks are due in labs.
- Weekly written quizzes are given in labs.
- Materials and info for lab are found on www.casa.uh.edu under MLAB 1431.

About the class

Attendance and Classroom Behavior

- Come to class on time and sit near the front.
- Turn cell phone off or on do not disturb.
- Do not read the newspaper, surf the web, or do anything that might disturb other students (including non-calculus discussions).
- Pay attention.
- Ask and answer questions.
- If you must come in late, or leave early, please be respectful of everyone else.

An Introduction to Functions

Let A and B be two nonempty sets. A function from A to B is a rule of correspondence that assigns to each element in A exactly one element in B. Here A is called the domain of the function and the set B is called the range of the function.

The Domain of a Function is defined as the set of all possible inputs allowed for that function.

To determine the domain of a function, start with all real numbers and then eliminate anything that results in zero denominators or even roots of negative numbers.

Section 1.1 - Review

The domain of any **polynomial function** is $(-\infty, \infty)$ or all real numbers.

The domain of any **rational function**, where both the numerator and the denominator are polynomials, is all real numbers except for the values of x for which the denominator equals 0.

The domain of any **radical function** with even index is the set of real numbers for which the radicand is greater than or equal to 0. The domain of any radical function with odd index is $(-\infty, \infty)$.

Average Rate of Change (Difference Quotient)

Suppose we have two points whose x values differ by h units. Then,

$$\frac{\text{change in } y}{\text{change in } x} = \frac{f(x+h) - f(x)}{(x+h) - x} = \frac{f(x+h) - f(x)}{h}$$

This is called the difference quotient or average rate of change for $f(x)$.

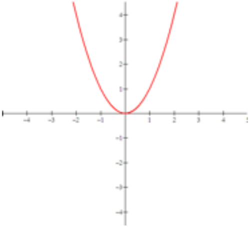
To find a difference quotient, you will compute $\frac{f(x+h)-f(x)}{h}$ assuming that $h \neq 0$. You can do this in three steps:

1. Compute $f(x+h)$
2. Compute $f(x+h) - f(x)$
3. Now divide this answer by h to find $\frac{f(x+h)-f(x)}{h}$

Example:

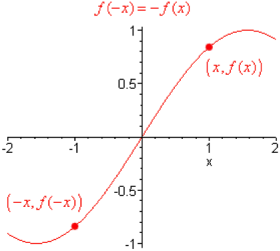
Find the difference quotient at $x = 2$ of: $f(x) = \dfrac{1}{x+1}$

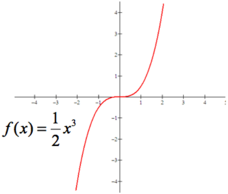
A function is **even** if $f(-x) = f(x)$ for all x in the domain of the function. Even functions are symmetric with respect to the $y-$axis. A very common even function is $f(x) = x^2$ whose graph is shown here:

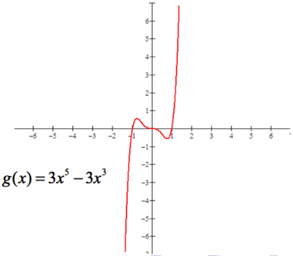


Section 1.1 - Review

A function is **odd** if $f(-x) = -f(x)$ for all x in the domain of the function. Odd functions have symmetry with respect to the origin. Here are a couple of examples of odd functions.



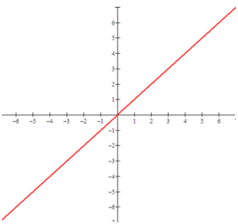




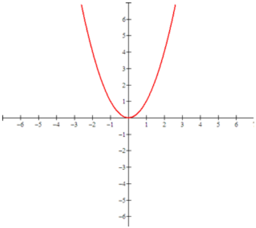
Section 1.1 - Review

Here are the basic functions. You should know the shapes of each graph, domain and range of the function, and you should be able to state intervals on which the function is increasing and intervals on which the function is decreasing.
You should be able to translate these graphs vertically and/or horizontally, reflect them about the x or the $y-$axis, and stretch them or shrink them vertically or horizontally.

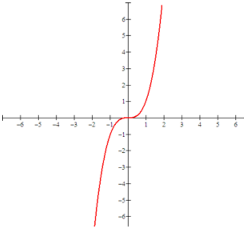
$f(x) = x$



$f(x) = x^2$

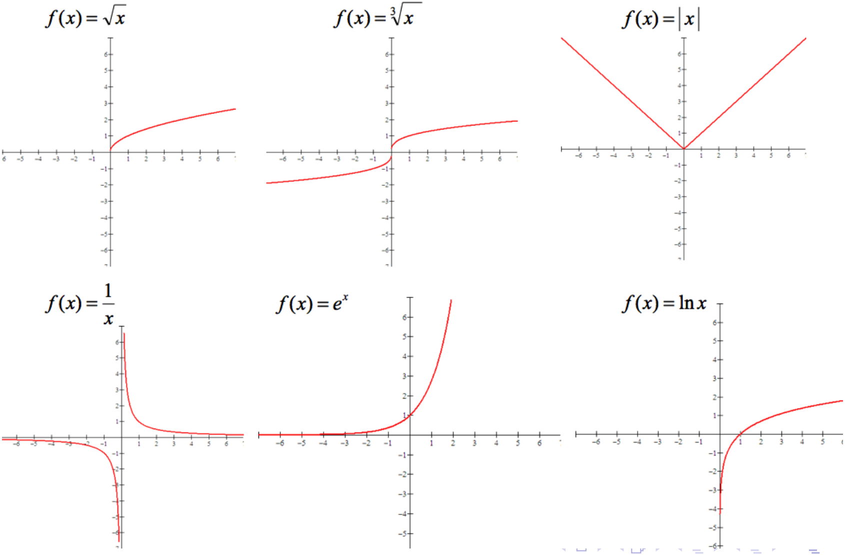


$f(x) = x^3$



Section 1.1 - Review

And some more:



Linear Functions

Recall: the equation of a line is

General form: $Ax + By = C$ (slope is: $m = -\frac{A}{B}$)

Slope-intercept form: $y = mx + b$ (where m is the slope and the point $(0, b)$ is the y-intercept)

Point-slope form: $y - y_1 = m(x - x_1)$

If two points on the line are given, then the slope is: $m = \frac{y_2 - y_1}{x_2 - x_1}$

Vertical lines are of the form: $x = c$

Horizontal lines are of the form: $y = c$

Two lines are parallel if they have the same slope.

Two lines are perpendicular if their slopes are negative reciprocals of each other.

Rational Functions

A rational function is a function of the form $f(x) = \dfrac{P(x)}{Q(x)}$, where P and Q are polynomial functions and $Q(x) \neq 0$. You'll need to be able to find the following features of the graph of a rational function and then use the information to sketch the graph.

- Domain
- Intercepts
- Holes
- Vertical asymptotes
- Horizontal asymptote
- Slant asymptote
- Behavior near the vertical asymptotes

Section 1.1 - Review

Domain: The domain of f is all real numbers except those values for which $Q(x) = 0$.

$x-$**intercept(s)**: The $x-$intercept(s) of the function will be all values of x for which $P(x) = 0$, but $Q(x) \neq 0$.

$y-$**intercept**: The $y-$intercept of the function is $f(0)$.

Holes: The graph of the function will have a hole at any value of x for which both $P(x) = 0$ and $Q(x) = 0$.

Vertical asymptotes: The graph of the function has a vertical asymptote at any value of x for which $Q(x) = 0$ but $P(x) \neq 0$.

Horizontal asymptote: You can determine if the graph of the function has a horizontal asymptote by comparing the degree of the numerator with the degree of the denominator.

- if the degree of the numerator is smaller than the degree of the denominator, then the graph of the function has a horizontal asymptote at $y = 0$.
- if the degree of the numerator is equal to the degree of the denominator, then the graph of the function has a horizontal asymptote at $y = \dfrac{\text{leading coefficient of numerator}}{\text{leading coefficient of denominator}}$
- if the degree of the numerator is greater than the degree of the denominator, then the graph of the function does not have a horizontal asymptote.

Note: The graph of a function $f(x)$ can never intersect the Vertical Asymptote. However, it MAY intersect the Horizontal Asymptote.

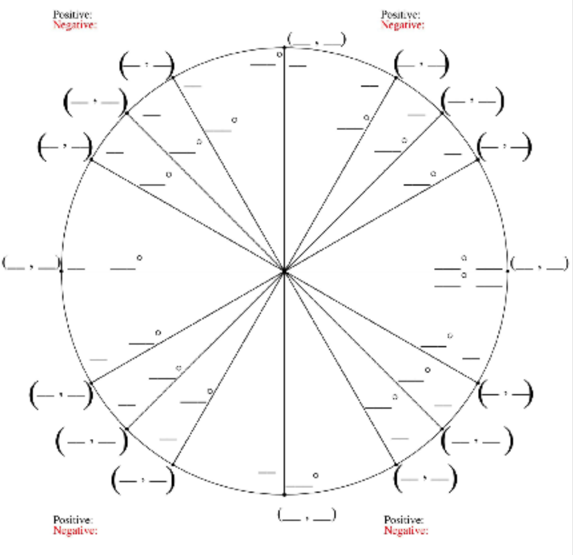
Example: Find the point at which $f(x) = \dfrac{x-2}{x^2-1}$ intersects its horizontal asymptote.

Example: Give the hole(s) and vertical asymptotes of $f(x) = \dfrac{x^2 + x}{x^2 - 1}$.

Values of Trigonometric Functions for Quadrantal Angles

	$0°$	$90°$	$180°$	$270°$	$360°$
	0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
Sine					
Cosine					
Tangent					
Cotangent					
Secant					
Cosecant					

The Unit Circle



The Chart

θ	$0°$	$30°$	$45°$	$60°$	$90°$
θ	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$
$\sin\theta$					
$\cos\theta$					
$\tan\theta$					
$\cot\theta$					
$\sec\theta$					
$\csc\theta$					

Quotient Identities

$$\tan\theta = \frac{\sin\theta}{\cos\theta}$$
$$\cot\theta = \frac{\cos\theta}{\sin\theta}$$

Reciprocal Identities

$$\csc\theta = \frac{1}{\sin\theta}$$
$$\sec\theta = \frac{1}{\cos\theta}$$
$$\cot\theta = \frac{1}{\tan\theta}$$

Pythagorean Identities

$$\sin^2\theta + \cos^2\theta = 1$$

$$\tan^2\theta + 1 = \sec^2\theta$$

$$1 + \cot^2\theta = \csc^2\theta$$

Opposite Angle Identities

$$\sin(-\theta) = -\sin(\theta)$$
$$\cos(-\theta) = \cos(\theta)$$
$$\tan(-\theta) = -\tan(\theta)$$
$$\csc(-\theta) = -\csc(\theta)$$
$$\sec(-\theta) = \sec(\theta)$$
$$\cot(-\theta) = -\cot(\theta)$$

Sum and Difference Formulas for Sine and Cosine

$$\sin(A+B) = \sin(A)\cos(B) + \sin(B)\cos(A)$$
$$\sin(A-B) = \sin(A)\cos(B) - \sin(B)\cos(A)$$
$$\cos(A+B) = \cos(A)\cos(B) - \sin(A)\sin(B)$$
$$\cos(A-B) = \cos(A)\cos(B) + \sin(A)\sin(B)$$

Sum and Difference Formulas for Tangent

$$\tan(A+B) = \frac{\tan(A)+\tan(B)}{1-\tan(A)\tan(B)}$$

$$\tan(A-B) = \frac{\tan(A)-\tan(B)}{1+\tan(A)\tan(B)}$$

Double Angle Formulas

$$\sin(2A) = 2\sin(A)\cos(A)$$

$$\cos(2A) = \cos^2(A) - \sin^2(A)$$

$$\tan(2A) = \frac{2\tan(A)}{1 - \tan^2(A)}$$

Half-Angle Formulas

$$\sin\left(\frac{A}{2}\right) = \pm\sqrt{\frac{1-\cos(A)}{2}}$$

$$\cos\left(\frac{A}{2}\right) = \pm\sqrt{\frac{1+\cos(A)}{2}}$$

$$\tan\left(\frac{A}{2}\right) = \frac{\sin(A)}{1+\cos(A)} = \frac{1-\cos(A)}{\sin(A)}$$

How do I get more help on material I don't remember?