Panel 1

Abducted by an alien circus company, Professor ~~Doyle~~ is forced to write calculus equations in center ring.

Welcome

to

Calculus 1

Bert

Wachsmuth

Panel 2

Calculus Overview

Office MH 119 D

~~xxxx~~

wachsmut@shu.edu

http://pirate.shu.edu/~wachsmut/

Dyknow: dyknows://secure.dyknow.com/shu.edu

Login: user id: (8-letters) wachsmut

password: (user id) wachsmut

Panel 3

Grading

Quizzes every week:	100
3 exams:	300
1 final:	100
Computer assignments:	100
	600 p

Course Content:

- Functions, limits, continuity
- derivatives
- applications
- integrals

(inverse functions)

Panel 4

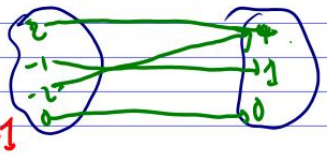
Functions

Def: A function is a rule that assigns to each element x in a set A exactly one element y or more commonly $f(x)$, in a set B.

Note: The set A is called: domain

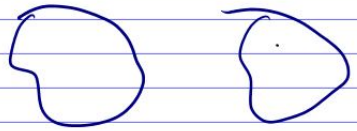
The set B is called: range

Ex: $f(x) = x^2$ $f(2) = 4$



✗ $g(x) = \frac{1}{x-1}$ Domain: $x \neq 1$

$k(x) = 5$



Panel 5

Representing a function

4 different ways:

- algebraically
- verbally
- graphically
- numerically

f is the function that takes any x and multiplies it by $\sqrt{}$,

e.g. $f(x) = \sqrt{x}$

Ex $f(x) = \sqrt{x+2}$

Domain: Need $x+2 \geq 0$

$\{x \geq -2\}$

$g(x) = \frac{1}{x^2 - x}$

Problem: $x^2 - x = 0$

$x(x-1) = 0$

$x = 0, 1$

Domain $\{x \neq 0, 1\}$

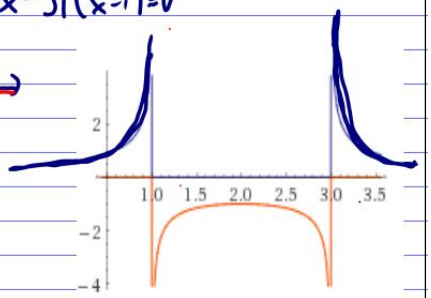
Panel 6

Ex: Find domain and range of $f(x) = \frac{1}{\sqrt{x^2 - 4x + 3}}$ ≠0

Domain: Need: $x^2 - 4x + 3 > 0$

$(x-3)(x-1) > 0$ $(x-3)(x-1) = 0$

Domain: $(-\infty, 1) \cup (3, \infty)$



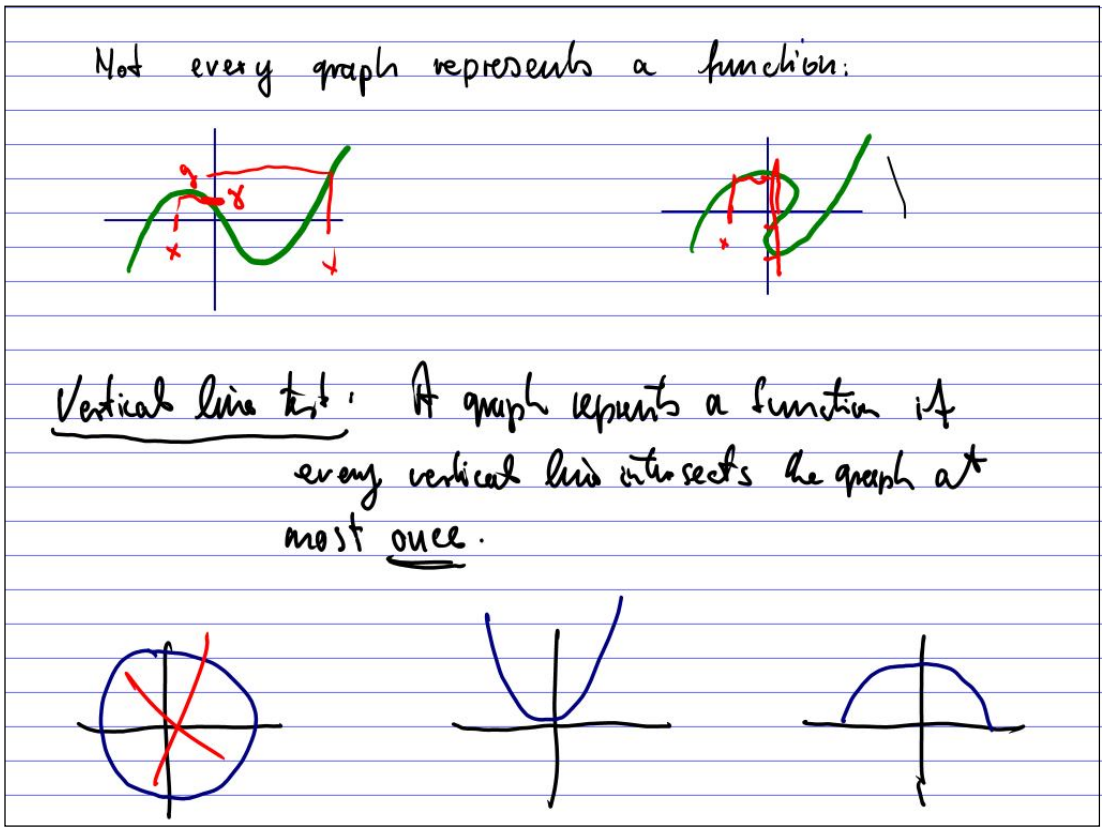
Range: easy if you see graph!

Outcome always positive, never zero, close to zero, ...

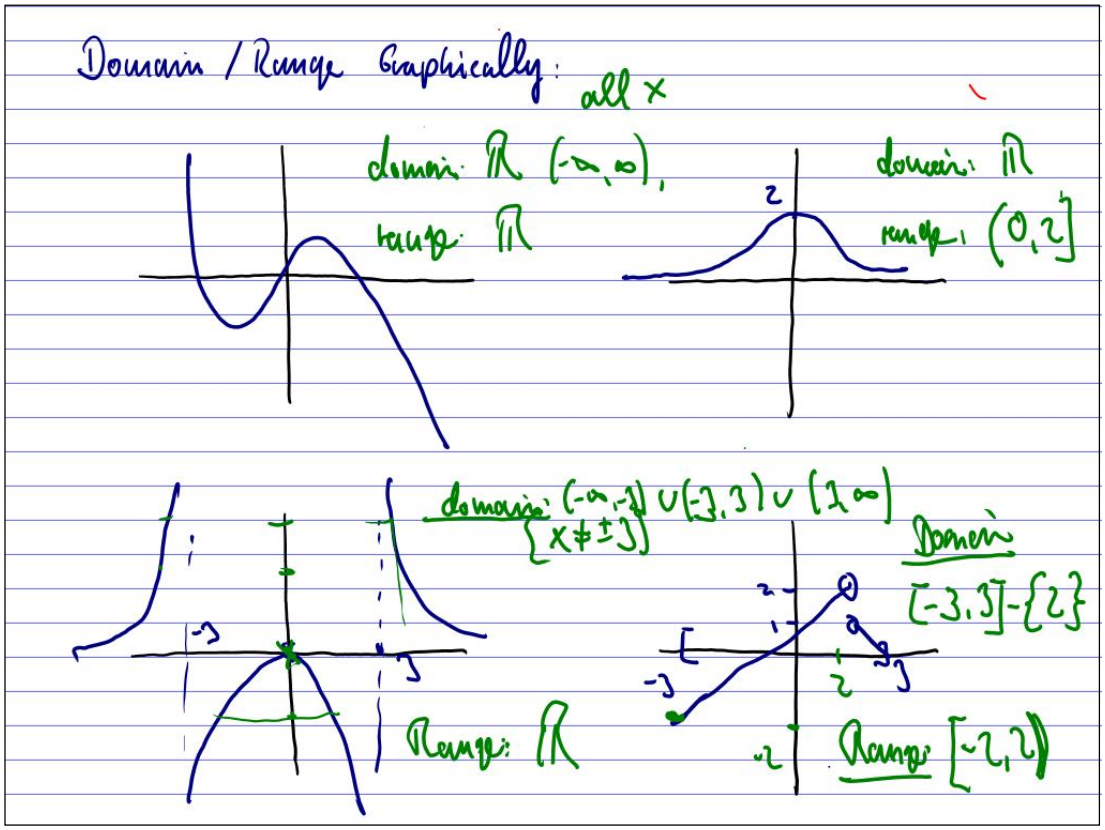
From graph you see: Range is $(0, \infty)$

$\{y > 0\}$

Panel 7



Panel 8



Panel 9

Piecewise defined functions:

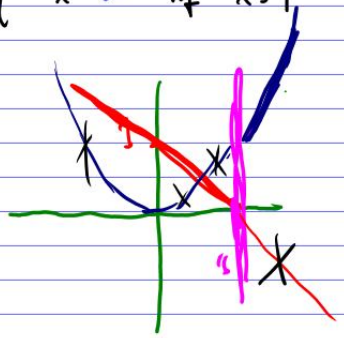
$$f(x) = \begin{cases} 1-x & \text{if } x \le 1 \\ x^2 & \text{if } x > 1 \end{cases}$$

$f(0) = 1$

$f(1) = 0$

$f(2) = 4$

Sketch graph:



linear, parabolas are known

Panel 10

Piecewise defined functions can be complicated

Ex:

$$f(x) = \begin{cases} \dfrac{x^2-4}{x-2} & \text{if } x < 0 \\ \dfrac{1}{x^2-1} & \text{if } 0 \le x < -1 \\ 2x^2+1 & \text{if } x \ge -1 \end{cases}$$

Find $f(-2) =$

$f(0) =$

$f(-1) =$

$f(5) =$

Domain of f (??)

Panel 11

A Function Catalog

linear ✓

power function ∪ or ∫

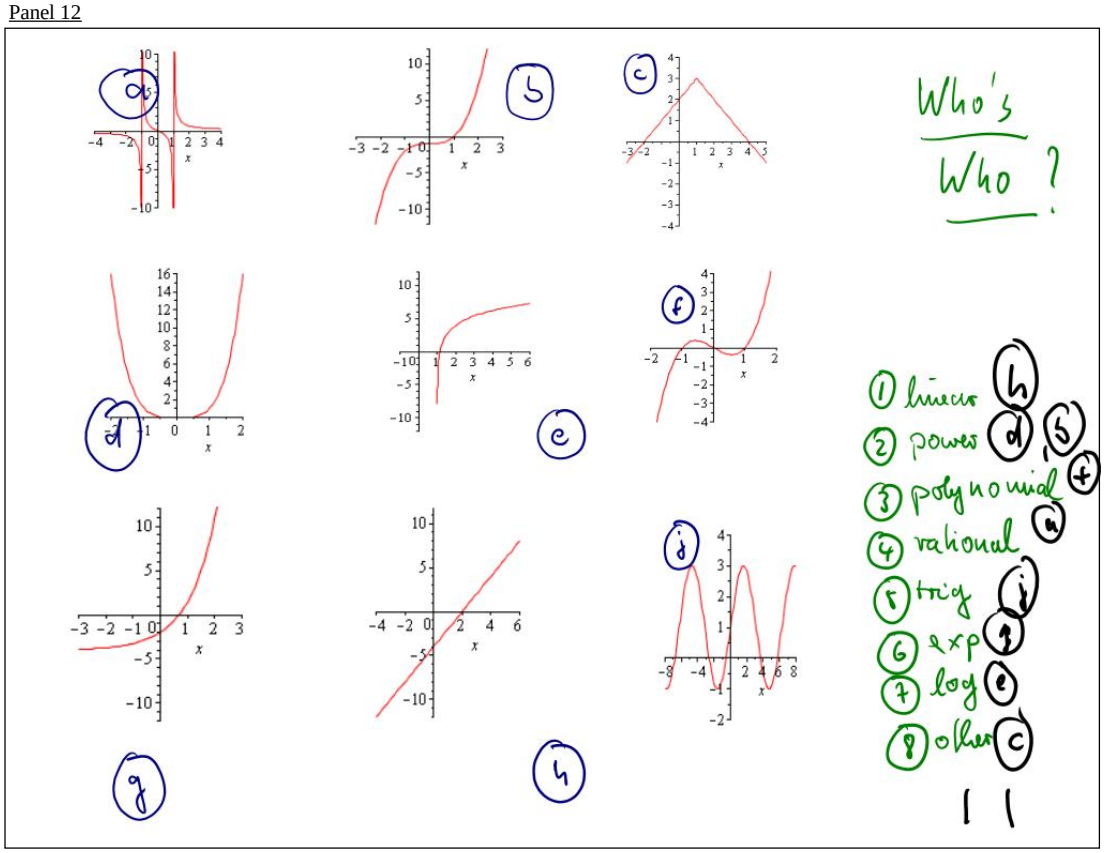
polynomials waves

rational asymptotes

trig periodic

exp + log grow fast or very slow

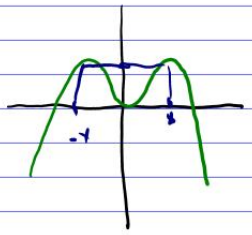
Panel 12



Panel 13

Symmetry: Some functions are symmetric about an axis or a point.

Ex)

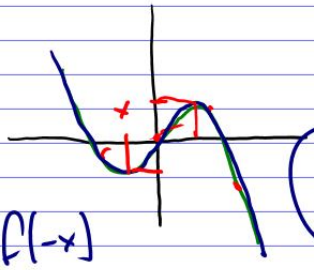


symmetric about (y-axis)

even

$f(x) = x^2$

$f(x) = f(-x)$



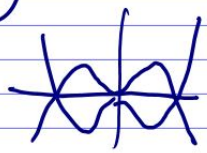
symmetric about Soln (xy axis)

about (origin)

odd

$f(x) = x^3$

$f(x) = -f(-x)$



Panel 14

Ex: Which of the following functions are $f(x) = f(-x)$

(a) even (b) odd (c) neither $f(x) = -f(-x)$

① $f(x) = x^3 - 2x$

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

odd

② $g(x) = 2x^4 + x^2 - 1$

$g(-x) = 2(-x)^4 + (-x)^2 - 1$

$= 2x^4 + x^2 - 1 = g(x)$

even

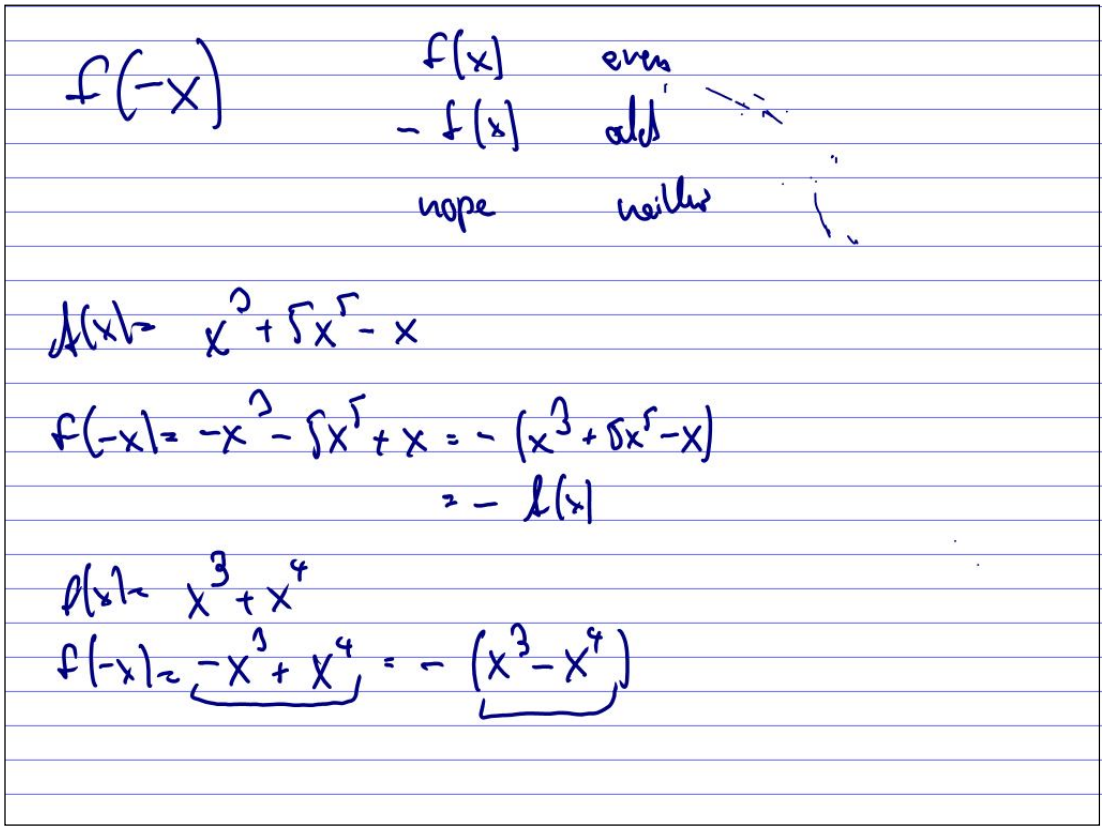
③ $h(x) = \tan(x)$ (HW)

④ $k(x) = x^3 e^{-x^2}$

$k(-x) = (-x)^3 e^{-(-x)^2} = -(x^3 e^{-x^2}) = -k(x)$

odd

Panel 15


f(-x)
f(x) even
-f(x) odd
nope neither
f(x) = x^3 + 5x^5 - x
f(-x) = -x^3 - 5x^5 + x = -(x^3 + 5x^5 - x)
= -f(x)
f(x) = x^3 + x^4
f(-x) = -x^3 + x^4 = -(x^3 - x^4)