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1 Welcome to Calculus and its Applications!

- Course website: http://math120.straub.link

    The place for all materials: syllabus, like lecture sketches, videos, …

- Piazza: questions and announcements
- MyLabsPlus: homework, quizzes and exams

    Username: J00XXXXXX
    Password: PASSWD
    You need to purchase a **MyLabsPlus access code**.

- Book: MyLabsPlus provides electronic version
- Calculator: not needed

    provided by Math Technology Lab during exams
    Online graphing calculator: https://www.geogebra.org/graphing

1.1 Syllabus

TL;DR

- Homework (30% of your grade) on MyLabsPlus

    no pressure: unlimited attempts
    "Question Help" button offers hints, videos and worked examples

- Quizzes (30% of your grade) on MyLabsPlus

    you get two attempts to take each quiz; 45min time limit

- 3 tests and final exam (40% of your grade)

    more details later

- Bonus for good attendance

    grade penalty for >2 unexcused absences

- Do you want or need MA125?

    Or any other class of the calculus sequence?
    If yes, then **this class is not for you**!

Let's recall some of the common kinds of functions.

- Polynomials:
  - linear functions: $f(x) = 2x - 3$
  - quadratic functions:

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

    [Review factoring and solving quadratic equations.]
  - cubic functions:

    $f(x) = 2x^3 - 3x^2 + x + 1$
  - higher degree:

    $f(x) = x^{17} - x^5 + 1$

    (this is a degree 17 polynomial)

Doing the Pre Calculus Dance

by chibipandora @ deviantART

HW. Cute as they are... a few ghosts need to seriously work on their moves!! Which?

- Rational functions:

  These are just quotients of polynomials.

  - $f(x) = \dfrac{x+1}{x-1}$

  - $f(x) = \dfrac{x^2 + 3x + 1}{x^3 + 1}$

- Algebraic functions:

  - square root: $f(x) = \sqrt{x} = x^{1/2}$

    For experts. Algebraic functions are those that appear when solving polynomial equations. For instance, $x^2 - 5 = 0$ has the solution $x = \sqrt{5}$.

- Exponential functions:

  - $f(x) = 2^x$ (2 is called the **base**)

  - $f(x) = e^x$ (with the natural base $e \approx 2.718$)

    We'll learn what makes this one of the most important functions.

- Logarithms:

  - $f(x) = \ln(x)$

- Trigonometric functions: (we will not discuss these)

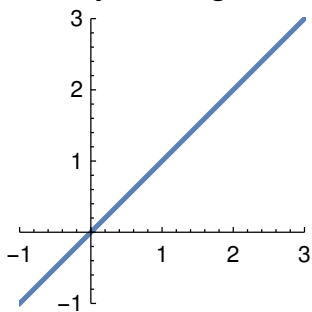 - $f(x) = \cos(x)$, $f(x) = \tan(x)$, ...
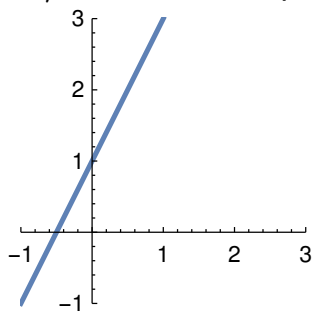
Play time! Plot several of these using GeoGebra

https://www.geogebra.org/graphing

1.3 Review: Lines and slope

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} \quad \left(\text{i.e.} \quad \frac{\text{change in } y}{\text{change in } x} \right)$$
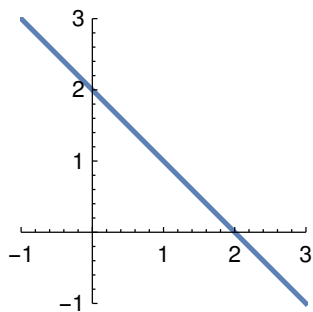
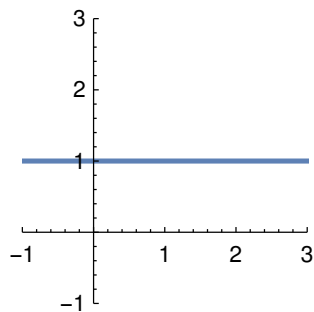Just by looking, estimate/read off the slope of each line.

$\text{slope} = 1$ $\qquad\qquad$ $\text{slope} = 2$ $\qquad\qquad$ $\text{slope} = -1$ $\qquad\qquad$ $\text{slope} = 0$

What are the y-intercepts?

$(0, 0)$ $\qquad\qquad$ $(0, 1)$ $\qquad\qquad$ $(0, 2)$ $\qquad\qquad$ $(0, 1)$

Using these values, what is the equation for the line?

$y = x$ $\qquad\qquad$ $y = 2x + 1$ $\qquad\qquad$ $y = -x + 2$ $\qquad\qquad$ $y = 1$

$y = mx + b$ describes a line with slope m and y-intercept $(0, b)$.

1.4 Tangent lines

tangere [latin] — to touch

On a curious tangential note, the origin of the word tango (the dance) is disputed (though the Latin meaning is fitting).

The fundamental insight of calculus is that (essentially) every function can be (locally) approximated with linear functions.

Play time! GeoGebra demo

Checklist.
- bookmark course website
- join Piazza
- sign into MyLabsPlus
  - immediately do "Easy Points" assignment
    (final due date: 8/22)
- graph some functions in GeoGebra

What else to do before next class?
- do "Chapter 0. Some review" assignment (5 questions)
- check out Sections 1.1 and 1.2 in the book
    (Book available in MyLabsPlus under "eText".)
- do "1.1, 1.2. Lines and slopes" (8 questions)