LARSON—MATH 255–CLASSROOM WORKSHEET 06
Python, Booleans & More Graphing.

1. Create a Cocalc/Sage Cloud account.

   (a) Start the Chrome browser.

   (b) Go to `http://cocalc.com`

   (c) "Create new account" using **your VCU email address** .

   (d) You should see an existing Project for our class. Click on that.

   (e) Click "New", then "Sage Worksheet", then call it **c06**.

   (f) For each problem number, label it in theSAGE cell where the work is. So for Problem 1, the first line of the cell should be `#Problem 1`.

Review

- Sketch the graph of $f(x) = x^5 + x^4 + x^3 - x^2 + x - 1$. Find the root (zero) of this function.
- Now try `find_root(`$x^5 + x^4 + x^3 - x^2 + x - 1$`,-1,0)`. Explain the result.

Python

2. Type in the following function definition and evaluate.

```
def absolute(x):
    if x>=0:
        return x
    else:
        return -x
```

3. Now test it. Try `absolute(4)`, `absolute(-4)`, etc.

4. Now *use* the program you just wrote in another program. Evaluate and test the following.

5. You can add any number to the result by adding a *parameter*. We can build more complex programs from simpler programs!

```
def abs_plus(x,y):
    return absolute(x)+y
```

6. Now test it. Try `abs_plus(4,5)`, `abs_plus(-4,5)`, `abs_plus(-4,23)`, etc.

7. Write your own function `triple_product` that takes *three* inputs (call them anything, or x, y, z is fine) and *returns* their product.

Boolean Expressions in Sage

A *boolean expression* is one that evaluates to True or False.

While "==" is used as a claim of equality of expressions (the left-hand-side and the right-hand-sides of the "==") the symbol "!=" is used to express in-equality.

8. Evaluate `5!=7`.

9. Evaluate `5!=5`.

10. We will *assign* a value to a variable "a". Then we will use that variable in a boolean expression. (These two lines can be typed in one cell, or each in its own cell). Type and evaluate:

```
a=5
a>2
```

Boolean expressions can be combined with *boolean operators* like "and" and "or".

11. Evaluate: `3==3 and 3==4`.

12. Evaluate: `3==3 or 3==4`.

More graphing and calculating basics

13. Make a point at $(4, 4)$: evaluate `point((4,4))`.

14. Make it bigger by adjusting the "size" parameter; evaluate `point((4,4),size=200)`. Try other values for `size`.

15. Draw a line from $(-1, 1)$ to $(4, 4)$ by evaluating `line([(-1,1),(4,4)])`. Try drawing a line with 3 points.

16. Make the line thicker by adjusting the "thickness" parameter: evaluate `line([(-1,1),(4,4)],thickness = 4)`. Try other values of `thickness`.

17. Make the line dashed by adjusting the "linestyle" parameter: evaluate `line([(-1,1),(4,4)],linestyle="dotted")`. Try another value for "linestyle" by reading the options from the help command `line2d?`.

18. Now make the line red.

19. Draw a triangle between $(1, 1)$, $(1, 2)$, and $(2, 1)$ using the line command.

20. Now draw a triangle between $(1, 1)$, $(1, 2)$, and $(2, 1)$ using the `polygon` command; find examples of how this command works with `help(polygon)`. What's the difference?

Getting your classwork recorded

When you are done, before you leave class...

(a) Click the "Make pdf" (Adobe symbol) icon and make a pdf of this worksheet. (If CoCalc hangs, click the printer icon, then "Open", then print or make a pdf using your browser).

(b) Send me an email with an informative header like "Math 255 - c06 worksheet attached" (so that it will be properly recorded).

(c) Remember to attach today's classroom worksheet!