

**LARSON—MATH 255—CLASSROOM WORKSHEET 10**  
**Intermediate Value Theorem.**

1. (a) Start the Chrome browser.  
(b) Go to `http://cocalc.com`  
(c) Login using **your VCU email address** .  
(d) Click on our class Project.  
(e) Click “New”, then “Worksheets”, then call it **c10**.  
(f) For each problem number, label it in the Sage cell where the work is. So for Problem 2, the first line of the cell should be `#Problem 2`.
2. **Warm-ups.** What will the following commands return in Sage? Answer and then use Sage to check.

(a) `n=6`  
`if n<7:`  
`print("{} is less than 7".format(n))`

(b) `n=6`  
`if n<5:`  
`print("{} is less than 7".format(n))`

(c) `i=0`  
`while i<7:`  
`print(i)`  
`i=i+1`

3. **First Challenge.** You won't learn just by typing in code examples. It helps. Put you've got to solve stuff—if you are to develop real skills you can use in your other classes.

2520 is the smallest number that can be divided by each of the numbers from 1 to 10 without any remainder. What is the smallest positive number that is evenly divisible by all of the numbers from 1 to 20.

**2<sup>nd</sup> Chance.** If you didn't get these last class, make sure you can do them now.

4. Write a definition for a function that prints the lists `[1..i]` for `i=1` to `i=4`. Use a while loop. Evaluate and test.
5. Now try to write a definition for a function that prints the lists `[1..i]` for `i=1` to `i=n`. Evaluate and test.

**Programming.**

6. What will the following code do?

```
def mystery1(n):  
    L=[1..n]  
    even = lambda x: x%2==0  
    print([even(k) for k in L])  
mystery1(9)
```

7. What will the following code do?

```
def mystery2(n):
    M=[]
    even = lambda x: x%2==0
    for i in [1..n]:
        if even(i)==True:
            M.append(i)
    print(M)
mystery2(9)
```

A *while loop* runs a block of code while a condition is still satisfied. A common way to use a while loop is in a test where you don't know precisely when the test condition will be met.

8. What will the following code do?

```
def mystery3(n):
    M=[]
    i=0
    even = lambda x: x%2==0
    while i<n:
        if even(i)==True:
            M.append(i)
        i=i+1
    print(M)
mystery3(9)
```

## Intermediate Value Theorem

If  $f(x)$  is a continuous function, and  $f(a) \leq c \leq f(b)$  then there is some real number  $x$  in the interval  $[a, b]$  where  $f(x) = c$  (that's the **Intermediate Value Theorem**). We will define a function that finds this  $x$ . We will do this in steps.

9. Given a continuous function  $f(x)$ , and numbers  $a$ ,  $b$  and  $c$ , define a function `check_conditions(f,a,b,c)` that returns True if  $f(a) \leq c \leq f(b)$  and False otherwise. Evaluate.
10. Let  $f(x) = x^2$ . Evaluate `check_conditions(f,1,2,3)` and `check_conditions(f,1,2,5)`. Is the output what you expected?
11. Given a continuous function  $f(x)$ , and numbers  $a$ ,  $b$  and  $c$ , define a function `test_average(f,a,b,c)` that returns the tuple  $(a, (a+b)/2)$  if  $f((a+b)/2) \geq c$  and returns  $((a+b)/2, b)$  if  $f((a+b)/2) < c$ .

## Getting your classwork recorded

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

- 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).
- Send me an email with an informative header like “Math 255—c10 worksheet attached” (so that it will be properly recorded)