Name:

Type

Use the following piece of code to answer questions 1 thru 5 (2 points each.)

```
def f():
    n = 0
    s = 'argag'
    x = ''

    while n < 10:
        x = s * n
        print x
        n += 1
```

1. What is the type of `n`?

2. What is the type of `x`?

3. What is the type of `n < 10`?

4. What is the type of `f`?

5. What is the type of `f()`?

Name:

Runtime

State the runtime of the functions in 6 thru 8 (5 points each.)

6. insertion sort

7. norm of a list

8. binary search

Code Tracing

Use the following piece of code for question 9

```
def log2(n):
    if n == 1:
        return 0
    else:
        return 1 + log2(n/2)
```

9. Show the stack diagram for the call `log2(32)`. (10 points)

Name:

Use the following piece of code for questions 10 **and** 11 **(5 points each.)**

```
def mystery_function(input_string):
    state = 'q0'
    idx = 0

    while idx < len(input_string):
        if state == 'q0':
            if input_string[idx] == 'a':
                state = 'q1'
            elif input_string[idx] == 'b':
                state = 'q0'
            else:
                raise RuntimeError, 'Invalid symbol at index %d' % idx
        elif state == 'q1':
            if input_string[idx] == 'a':
                state = 'q1'
            elif input_string[idx] == 'b':
                state = 'q2'
            else:
                raise RuntimeError, 'Invalid symbol at index %d' % idx
        elif state == 'q2':
            if input_string[idx] == 'a':
                state = 'q3'
            elif input_string[idx] == 'b':
                state = 'q0'
            else:
                raise RuntimeError, 'Invalid symbol at index %d' % idx
        elif state == 'q3':
            if input_string[idx] == 'a':
                state = 'q1'
            elif input_string[idx] == 'b':
                state = 'q2'
            else:
                raise RuntimeError, 'Invalid symbol at index %d' % idx
        else:
            raise RuntimeError, 'Invalid state'

        idx += 1

    return state == 'q3'
```

Name:

10. What is the value of `mystery_function('aabbabbababa')`

11. What is the value of `mystery_function('bababbbabbba')`

Name:

Use the following piece of code for questions 12 **thru** 14

```
trolliac = {
    'Terezi' : 'Libra',
    'Kanaya' : 'Virgo',
    'Gamzee' : 'Capricorn',
    'Karkat' : 'Cancer',
    'Aradia' : 'Aries',
    'Sollux' : 'Gemini',
}
```

12. What is the value of the list after executing `trolliac['Feferi'] = 'Pisces'` (3 points.)

13. What is the result of `print trolliac['Equius']` (3 points.)

14. What is printed to the screen when the following loop is executed (4 points):

```
for troll in trolliac:
    print troll
```

Code Writing

15. Translate the following Python code into MATLAB (10 points):

```
def factorial_difference(n):
    difference = factorial(n)

    for i in range(1, n):
        difference -= factorial(i)

    return difference

def factorial(n):
    product = 1

    for i in range(1, n+1):
        product *= i

    return product
```

16. Write a function `string_to_int` which takes a string representing some integer and returns the actual integer value of the string (*e.g.* the string `'342'` would return the number 342.) N.B. You *are not* allowed to use the built in `int()` function. If you simply return the value of calling that, you will get no points. (13 points.)

17. Write a function `mean` which takes a list and returns the *mean* (in the mathematical sense - don't overthink this) of that list. (13 points.)

18. Write a function `nth_index_of` which takes a list $stuff$, a value elt and a number n and returns the index of the nth occurence of elt in $stuff$. If there are less than n copies of elt in $stuff$, then the function should return -1. (14 points.)