CS 1501 Quiz 3

KEY
1. (4 points) Consider the following function from FlowEdge.java. This function is used to allocate flow to an edge in a residual graph. Fill in the blanks with the appropriate type of edge.

```java
public void addResidualFlowTo(int vertex, double delta) {

    // allocate flow to a _________________ edge
    if (vertex == v) flow -= delta;

    // allocate flow to a _________________ edge
    else if (vertex == w) flow += delta;

    else throw new IllegalArgumentException("Illegal endpoint");

    if (Double.isNaN(delta))
        throw new IllegalArgumentException("Change in flow = NaN");
    if (!(flow >= 0.0))
        throw new IllegalArgumentException("Flow is negative");
    if (!(flow <= capacity))
        throw new IllegalArgumentException("Flow exceeds capacity");
}

ANSWER:

2 Backwards
2 Forward
2. (12 points) Consider the RSA public key $n = 55, e = 17$. Crack this key and give the values of the following:

- $p \& q$
- $\phi(n)$
- $d$

**ANSWER:**

4 $p \& q = 11 \& 5$
2 $\phi(n) = 40$
6 $d = 33$

Will get -7 back from \text{XGCD}(40, 17), d should be positive, $-7 \pmod{\phi(n)}$ is 33

-7 is worth 5 points

Stating that \text{XGCD}(40, 17) should be used to find $d$ or attempting \text{XGCD}(40, 17) is 3 points
3. (9 points) Use Dijkstra’s algorithm to determine the shortest path from vertex A to vertex G in the following graph. Be sure to state:

- The shortest path from A to G
- The weight of that path
- The order in which you visit the vertices of the graph in finding the shortest path

**ANSWER:**

3 Shortest path: A D F G
2 Weight of 20
4 Visited order: A B C D E F G