[**Open book, handouts, and notes**] Show all of your work clearly in the space provided or on the additional page at the end of the exam. If the additional page is used, clearly identify to which exam question it is related. Be sure to **read each problem carefully**. You should answer all 4 questions. Note that the exam is double sided.

1. (15 points) List the member functions that are automatically created by the compiler if not explicitly defined in the class. Give specific reasons for not using the automatically generated versions of these member functions.

2. (15 points) Write a function called max that will accept an STL list of `double`s and return the largest `double` in the list.

3. (15 points) If any errors are present in the following code, identify the line where the first error occurs, and draw a diagram (like the ones done in lecture) to describe the memory conditions just prior to the error. If no error(s) is/are present, draw a diagram to describe the memory conditions after lines 1-23 have been executed.

```
int main()
{
  const double x = 3.14;
  double y[3];
  int i = -17;
  int j = 22;
  int& k = i;
  for(j=0; j<1; ++j) {
    int* ptr1 = &j;
  }
  int* ptr2;
  int* ptr3 = 0;
  int* ptr4 = &i;
  ptr3 = ptr4;
  ptr4 = 0;
  double* ptr5 = &x;
  double* ptr6 = &y[1];
  ptr5 = y;
  --ptr6;
  if(ptr5!=ptr6) {
    i = 7;
  }
  ptr6++;

  return 0;
}
```

4. In this multi-part problem, you will make use of a Date class. The class definition is as follows:

```
class Date
{
public:
  Date();
  unsigned int getDay() const;
  unsigned int getMonth() const;
  unsigned int getYear() const;
  void setDate(unsigned int mon, unsigned int dy, unsigned int yr);
  void advanceDay();
  void insert(ostream& os) const;
  void extract(istream& is);
private:
  unsigned int month;
  unsigned int day;
  unsigned int year;
};
```

(a) (15 points) Write the UML description for the Date class given above.

(b) (10 points) Write the implementation for a constructor that will allow the date to be set when a Date object is declared. You may assume that the following `private` member function is available to you:

```
// Given a month (1--January, 2--February, ... 12-December) and
//   a year, it returns the number of days in the month
unsigned int numberOfDays(unsigned int mn, unsigned int yr);
```

(c) (10 points) Suppose we wish to use the constructor implemented in part **(b)** as the default constructor where the default date is 4/6/2000. Indicate how the default constructor's prototype in the class definition should be modified.

(d) (10 points) Write the extract member function of the Date class. Your implementation should allow the date to be specified in all of the following ways:

```
4/5/2000
4-5-2000
 4- 5-2000
04/05/2000
```

Due to time limitations, your implementation may assume that the date given is a valid date.

(e) (10 points) Overload the extraction operator so that it is possible to do the following:

```
Date aDate;
Date anotherDate;
cin >> aDate >> anotherDate;
```

Additional work area for any problem. Clearly identify to which problem the work on this page is related.

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