CS2134 Homework Assignment 3
Fall 2016
Due* 4:30 p.m. Wed. Sept 28, 2016

September 24, 2016

Assignment 3 include a programming portion and a written portion. The programming portion must compile and consist of a single file (hw03.cpp), and the written portion should consist of a single file (hw03written) in a .pdf format. Be sure to include your name at the beginning of each file! You must hand in both files via NYU Classes.

Programming Part:

1. Write a function template called `print_if` that:

   - takes three parameters: two iterators `start`, `end`, and a functor `pred`

     `start` and `end` have the capabilities of a forward iterator, and refer to a range `[start,end)` in a container

     `pred` is a functor that takes an element in the range `[start,end)` as an arguement and returns a `bool`
   - prints[1] all items in the range `[start,end)` which evaluates to `true`
   - runs in $O(n)$ time where n is the number of items in the range `[start,end)`

   The signature of your function template is:

```
template< class Itr, class UnaryPred >
void print_if( Itr start, Itr end, UnaryPred pred )
```

   A small amount of extra credit will be given for figuring out how to add your own test case to the unit test for this assignment.

*A bonus of %5 percent will be given if you turn in this homework assignment by Tues. Sept 27 at 11:00 p.m.

[1]Print each item on its own line

Written Part

1. For the `vector` class, and for the following code[2] snippet:

```
vector<int> c { 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 };
vector<int>::iterator itr1 = c.begin()+2;
vector<int>::iterator itr2 = c.begin()+4;
vector<int>::iterator itr3 = c.begin()+8;
cout << *(c.begin( ) + ( c.end( ) - c.begin( ) )/2 ) << endl;

c.erase(itr2);

cout << *itr1 << endl;
cout << *itr2 << endl;
cout << *itr3 << endl;
cout << *(c.begin( ) + ( c.end( ) - c.begin( ) )/2 ) << endl;
```

   What is printed? Explain your answer.[3]

2. Using big-Oh notation, give the worst case run time for the method `print_if`, which you implemented programming problem 1.

3. Given the following code snippet:

```
vector<int> a  {1,2,3,4, ..., n}; // vector, a, has n items
vector<int>::iterator itrStart;
vector<int>::iterator itrMid;
vector<int>::iterator itrEnd;
```

   Assign values to the iterators, `itrStart, itrMid, itrEnd`, so that:

   (a) `[itrStart, itrMid)` refers to the range `1`,2, 3, ..., n/2

   (b) `[itrMid, itrEnd)` refers to the range `n/2+1`,n/2+2, ..., n

4. For each code snippet below state either why the code won't compile/run, or state what is printed by the code snippet.

   (a)
```
vector<int> a {1, 2, 3, 4, 5};
vector<int>::iterator itra = a.begin();
cout << *(itra + 3);
```

   (b)
```
list<int> b {1, 2, 3, 4, 5};
list<int>::iterator itrb = b.begin();
cout << *(itrb + 3);
```

[2] Remember `c.end() - c.begin()` returns the number of items in the range `[ c.begin(), c.end() )`

[3] Hint: think of how you implemented the erase method in the Vector class.

(c)
```
list<int> c {1, 2, 3, 4, 5};
list<int>::iterator itrc = c.end();
itrc--;
cout << *(itrc);
```

(d)
```
vector<int> d {1, 2, 3, 4, 5};
vector<char>::iterator itrd = d.begin();
cout << *(itrd + 3);
```