

Sample Review Questions

1. (*Scoping*) In the code below, what is the value of $x + f(x)$ on line 7 under dynamic scoping? What about under static scoping?

```
int x = 4;
{
  int f ( int y ) { return x + y ; }
  {
    int x = 9;
    {
      x + f ( x );
    }
  }
}
```

2. (*Garbage Collection*) Suppose that you wish to add finalizers to your garbage collected language, so that user specified code will be called when objects are reclaimed. Explain some of the complications that may arise. Address the following issues:

- Exceptions during finalizers
- Finalizers that resurrect other garbage
- Interactions with threading

3. (*Functional vs. Non-functional*) Explain why object-oriented languages are rarely functional.

4. (*Lambda Calculus*) Explain the function of the following expression. What might it be useful for?

$$\lambda f.(\lambda x.f(xx))(\lambda x.f(xx))$$