Your name:

Due: Wednesday, November 13

Instructions: Review the course honor policy for written homeworks.

This cover sheet must be the front page of what you hand in. Fill out the left column in the table to the right after we go over each problem in class, according to the rubric below.

This rubric is also on the website, in more detail, under “Other Stuff” → “Grading Rubrics”.

Make sure all problems are submitted IN ORDER.

- **5**: Solution is completely correct, concisely presented, and neatly written.
- **4**: The solution is mostly correct, but one or two minor details were missed, or the presentation could be better.
- **3**: The main idea is correct, but there are some significant mistakes. The presentation is somewhat sloppy or confused.
- **2**: A complete effort was made, but the result is mostly incorrect. There may be some basic misunderstandings of the topic or the problem.
- **1**: The beginning of an attempt was made, but the work is clearly incomplete.
- **0**: Not submitted.

Comments or suggestions for the instructor:

What other students did you work with?

Citations (be specific about websites):
# 1 Pass by what?

Here is a small SPL program with a single function that gets called twice. (Not that it matters, but you may assume lexical scoping here.)

```splits
new a := 20;
new b := 10

new foo := lambda x {
    x := x + x;
    ret := x * b;
}

write foo@a;
write a;
write foo@b;
write b;
```

Clearly four numbers will get printed by this piece of code. Tell me what those four numbers will be under:

- a) Pass by value
- b) Pass by reference
- c) Pass by value/result

# 2 Value/result example

In Java function parameters are passed by sharing by default. In class, we saw a different kind of parameter passing mode called pass by value/result. Write a small Java program demonstrating that function parameters in Java really are passed by sharing and not by value/result. That is, your program should do something different in each of these parameter passing modes.

As always, I want you to come up with your own examples! You can work together on homeworks, but the examples you turn in should be unique.

Clearly specify what the result of your function would be under pass by sharing and under pass by value/result.
3 Overloading and polymorphism

Answer the following questions to demonstrate your knowledge of these concepts.

a) Why doesn’t Python support function overloading the way C++ and Java do?

b) What would need to be added to the SPL language in order to make function overloading possible?

c) What would need to be added to the SPL language in order to make subtype polymorphism possible?

d) The following code works in C++ and prints “2”:

```cpp
bool x = true;
cout << x + x << endl;
```

But the C++ standard says that the + operator only works for numeric types, not for bools. What’s going on here?

4 Hello, world!

Write a C++ program that prints (exactly) the string “Hello, world!” (followed by a newline), and demonstrates assignments using as many different kinds of l-types that you can in C++.

For full credit, your assignments should be somehow meaningful or useful. So for example, the program

```cpp
int a = 3;
a++ = 29;
cout << "Hello, world!" << endl;
```

would not receive full credit, because the assignments with a had nothing to do with the output. Something like

```cpp
string s = "Hello, world!";
s[7] = 'w';
cout << s << endl;
```

would be more like it. But of course you will need to have more assignments than this to demonstrate all the different kinds of l-values!

Print out your code and turn it in. Within your code printout, circle all the l-values that you see.