CSE 341: Programming Languages

Autumn 2005

Lecture 10 — Free Variables and Argument Subsitution - Mini-Exercises

Free Variables - Mini-Exercise 1

What are the free variables in the following ML expressions?

```
a+b;
```

```
let val y=10
in
    x+y+10
end;
```

Free Variables - Mini-Exercise 2

What are the free variables in the following ML expression?

```
let val x=1;
    val y=x+z
in
    let val y=10;
        val z=20;
    in
        w+x+y+z
    end
end;
```

Argument Subsitution - Mini-Exercise 1

Use the rule that `(fn x => e1) e2` is equivalent to `e3` where `e3` is `e1` with every `x` replaced by `e2` (with some restrictions!)

For example, `(fn x => x+y) 3` is equivalent to `3+y`

For each of these cases, either give the result of applying the rule, or say that it isn't possible (and why).

```
(fn x => x + let val x=100 in x+y end) 3
```

```
(fn x => let val y=100 in x+y end) y
```

```
(fn x => 42) (1 div 0)
```

```
(fn x => x+x+x) (horrible 100000)
```