

**Exercise 6.8:** Give an example of a TIP program where the narrowing sequence diverges for the interval analysis, when using widening followed by narrowing.

**TIP 程序:**

```
x = 0;
y = -2;
y = y-1;
while(input){
    y = -2;
    y = y-1;
    y = y+x;
    x = x+1;
}
```

**without widening:**

```
[x→⊥, y→⊥]
[x→[0,1], y→[-3,-3]]
[x→[0,2], y→[-3,-2]]
[x→[0,3], y→[-3,-1]]
...
```

序列发散!

**with widening:**

```
B = {-∞, -2, -1, 0, 1, ∞}
[x→⊥, y→⊥]
[x→[0,1], y→[-∞, -2]]
[x→[0,∞], y→[-∞, -1]]
[x→[0,∞], y→[-∞, 0]]
[x→[0,∞], y→[-∞, 1]]
[x→[0,∞], y→[-∞, ∞]]
```

序列收敛, 此处达到不动点

**using widening followed by narrowing:**

```
[x→⊥, y→⊥]
[x→[0,1], y→[-∞, -2]]
[x→[0,∞], y→[-∞, -1]]
[x→[0,∞], y→[-∞, 0]]
[x→[0,∞], y→[-∞, 1]]
[x→[0,∞], y→[-∞, ∞]]
...
```

```
[x→[0,∞], y→[-3, -3]]
[x→[0,∞], y→[-3, -2]]
[x→[0,∞], y→[-3, -1]]
...
```

narrowing 后序列发散!