INSTRUCTIONS

- You have 10 minutes to complete this quiz.
- The exam is closed book, closed notes, closed computer, closed calculator.
- Mark your answers on the exam itself. We will not grade answers written on scratch paper.
- For multiple choice questions, fill in each option or choice completely.
  - ☐ means mark all options that apply
  - ○ means mark a single choice

<table>
<thead>
<tr>
<th>Last name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>First name</td>
<td></td>
</tr>
<tr>
<td>Student ID number</td>
<td></td>
</tr>
<tr>
<td>CalCentral email (<a href="mailto:_@berkeley.edu">_@berkeley.edu</a>)</td>
<td></td>
</tr>
<tr>
<td>Discussion Section</td>
<td>___ ___ ___</td>
</tr>
</tbody>
</table>

All the work on this exam is my own. (please sign)

0. **Your thoughts?**  Draw your favorite Halloween costume idea!
1. **Bubba Gump**

Write the output displayed by the interactive Python interpreter when each expression below is evaluated.

```python
class Tree:
    def __init__(self, label, branches=[]):
        self.label = label
        self.branches = list(branches)
    def is_leaf(self):
        return not self.branches
    def __repr__(self):
        if self.is_leaf():
            return 'Tree(' + repr(self.label) + ')
        return 'Tree(' + repr(self.label) + ' ' + repr(self.branches) + ')

forrest = Tree(1)
gump = Tree(1, [forrest, forrest])
forrest.label = 2
forrest = Tree(forrest)

run = Tree(forrest, gump.branches)

>>> run
```

```python
>>> forrest.label = 1
>>> run
```

2. **Seeing the Forest for the Trees**

Implement `all_paths` which takes a `Tree` and returns a list of linked list paths from the root to each leaf.

```python
def all_paths(t):
    if __________________________:
        return ______________________
    paths = []
    ________________________________________________________________:
        paths += ______________________________________________________
    return paths
```

```python
def __init__(self, first, rest=empty):
    self.first = first
    self.rest = rest
```

```python
class Link:
    empty = ()
def __init__(self, first, rest=empty):
    self.first = first
    self.rest = rest
```

```python
def all_paths(t):
    if __________________________:
        return ______________________
    paths = []
    ________________________________________________________________:
        paths += ______________________________________________________
    return paths
```