Consider the following sequence of numbers:

5, 20, 10, 6, 7, 3, 1, 2, 7, 8, 11, 3

(a) Insert these numbers into a min-heap where each node has up to three children, instead of two.

(So, instead of inserting into a binary heap, we’re inserting into a ternary heap.)

Draw out the tree representation of your completed ternary heap.

**Solution:**

```
          1
         /|
        / |/
     3   2  3
    /   /   |
   20  7   5 10
   /   /   /   |
  7   8   11  6
```

(b) Draw out the array representation of the above tree.

**Solution:**

1, 3, 2, 3, 20, 7, 5, 10, 7, 8, 11, 6

(c) Given a node at index $i$, write a formula to find the index of the parent.

**Solution:**

\[
\text{parent}(i) = \left\lfloor \frac{i - 1}{3} \right\rfloor
\]

(d) Given a node at index $i$, write a formula to find the $j$-th child. Assume that $0 \leq j < 3$.

**Solution:**

\[
\text{child}(i, j) = 3i + j + 1
\]