

## 5) (10 pts) ALG (Base Conversion)

Write a function that takes a string *str* and an integer *b* (where  $2 \leq b \leq 10$ ), and returns 1 if *str* represents an integer in base *b* that is a perfect power of *b*. For example:

```
isPower("323", 4);    // Return 0.  $323_4 = 59_{10}$ , which is not a power of 4
isPower("27", 3);     // Return 0. 27 is not a valid base 3 integer.
isPower("plum", 8);   // Return 0. plum is not a valid base 8 integer.
isPower("1000", 10);  // Return 1.  $1000_{10}$  is a power of 10 ( $10^3$ )
isPower("000001", 2); // Return 1.  $1_2 = 1_{10}$ , which is a power of 2 ( $2^0$ )
```

**Notes:** You may assume *b* is always within the range specified above. Your function must return 0 if *str* is NULL or the empty string. Strings may be padded on the left with any number of zeros.

// You must use this function signature. You may write helper functions as  
// needed:

```
int isPower(char *str, int b);
```

```
int charToInt(char c) { return c - '0'; }
```

```
int isPower(char *str, int b)
{
    int i, length, c, flag = 0;

    if (str == NULL || str[0] == '\0')
        return 0;

    for (i = 0; i < strlen(str); i++)
    {
        // Convert this character to an integer.
        c = charToInt(str[i]);

        // If this is not even a valid digit in base b, return 0.
        if (c > b - 1 || c < 0)
            return 0;

        // Key insight: For this to be a perfect power of b, we must
        // have '1' followed by '0's only.
        if (c == 1)
        {
            if (flag > 0) // If we have seen more than one '1', it's over.
                return 0;
            flag = 1;
        }
        // Can't have anything but 0's and 1's.
        else if (c != 0)
        {
            return 0;
        }
    }
    return flag;
}
```

**Grading:** 4 pts - for taking care of invalid cases, 1 pt - returns 1 or 0 for all cases, 2 pts - rejects strings that have anything but 0 or 1, 2 pts - rejects any string with > 1 non-zero char, 1 pt - accepts correct strings