A. In our image processing assignment, we used four kernels to detect particular kinds of edges. For example, one kernel detected horizontal edges, where the color value increased across the edge, as we moved from top to bottom. Now, design a $3 \times 3$ kernel that detects diagonal edges, that run from top-right to bottom-left, where the color value increases across the edge as we move from top-left to bottom-right.

B. Here is our `mappedImage` code, without comments. List the types of the expressions given.

```python
def mappedImage(image, f):
    width = image.getWidth()
    height = image.getHeight()
    newImage = cImage.EmptyImage(width, height)
    for row in range(height):
        for col in range(width):
            pixel = image.getPixel(col, row)
            rgb = [pixel.getRed(), pixel.getGreen(), pixel.getBlue()]
            newRGB = f(rgb)
            newPixel = cImage.Pixel(newRGB[0], newRGB[1], newRGB[2])
            newImage.setPixel(col, row, newPixel)
    return newImage
```

a. f:  
b. width:

c. row:  
d. pixel:

e. rgb:  
f. f(rgb):
C. What is the running time, in $\mathcal{O}$-notation, for a list of length $n$? Show detailed work.

```python
# Sorts a list of numbers, by altering the list in place. Returns the list.
# Input: List of numbers. Output: List of numbers.
def insertionSortInPlace(l):
    for i in range(1, len(l)):
        temp = l[i]
        hole = i
        while hole > 0 and l[hole - 1] > temp:
            l[hole] = l[hole - 1]
            hole -= 1
        l[hole] = temp
    return l
```

D. In $\mathcal{O}$-notation, what is the efficiency of the encryption step of the RSA cryptosystem? Define any variables that you introduce, and explain your answer.
E. Write the following function recursively. (Yes, it’s from the homework.)

# Returns the sum of two lists of numbers (of equal length >= 0).
# Input: List of numbers. List of numbers of the same length.
# Output: List of numbers of the same length.

def listSum(a, b):

F. Write the following function recursively.

# Returns the binary numeral for the given number, as a list of bits.
# Input: Nonnegative integer. Output: List of 0s and 1s.

def bits(n):
G. In a typical graphical user interface for computers, the user can initiate actions by clicking on-screen buttons with the mouse. For example, when a button labeled “Print” is clicked, this button calls upon the program’s \texttt{printDocument} function, to begin printing. Think about what attributes an object of class \texttt{Button} might have, and write the class’ initialization method.