

Nov 14 Homework

1. How many ordered partitions (compositions), with 4 parts, of 20 are there? That is, how many solutions to $x_1 + x_2 + x_3 + x_4 = 20$, with $x_i \geq 1$ are there? (Remember, order is important, so $x_1 = 1, x_2 = 3, x_3 = 7, x_4 = 9$ is not the same as $x_1 = 9, x_2 = 7, x_3 = 3, x_4 = 1$, for example.)
2. How many solutions to $x_1 + x_2 + x_3 + x_4 = 20$, with $x_i \geq 0$ are there? (Hint: substitute $y_i = x_i + 1$ and convert to the form in problem 1).
3. Suppose we want to know how many **unordered** partitions of 20 there are, with at most 4 parts? Explain how you could determine this number, using generating functions; however, you do not need to carry out the work to actually find the answer.
4. At the beginning of chapter 12 it is claimed that there are a total of 627 unordered partitions of 20. Explain how you could determine this number, using generating functions; again, no need to do the calculations.
5. The MATLAB program below calculates the answer to one of the above problems—which problem?

```
p = 0;
for i1=0:1:20
for i2=0:2:20
for i3=0:3:20
for i4=0:4:20
    n=i1+i2+i3+i4;
    if (n==20)
        p = p+1;
    end
end
end
end
end
p
```