Name:

1. (18 points) Find the following anti-derivatives:

   (a) $\int x\sqrt{x+2}dx =$

   (b) $\int \cos^2(2x)dx =$

(c) $\int xe^{x^2}dx =$

(d) $\int x^2e^x dx =$

(e) $\int \tan^3(6x)dx =$

(f) $\int \frac{1}{x^2 - x - 2}dx =$

2. (6 points) Let $C = \int \frac{\cos x}{\sin x + \cos x} dx$ and $S = \int \frac{\sin x}{\sin x + \cos x} dx$.

(a) Find $C + S$.

(b) Find $C - S$.

(c) Use parts (a) and (b) to find C and S.

3. (6 points) There are 13 Mathematics HL students. 9 girls and 4 boys. A team of 3 students is to be selected to take part in mathematics competition. If the students are selected at random, find the probability that:

   (a) 3 girls are selected.

   (b) At least 1 girl is selected.

   (c) There are more boys on the team, given that at least one girls has been selected.

4. (4 points) 7 distinct books are to be placed on a shelf. 3 of these are Maths books. In how many way can this be done if:

   (a) Maths books are to be kept together?

   (b) No two maths books are to be placed next to each other?

5. (6 points) There are two rows of 5 chairs each. In how many way can 10 people sit on these chairs (one person occupies one sit) if:

   (a) there are no restrictions?

   (b) Tomasz and Maria must sit so that one is behind the other?

   (c) Tomasz and Maria cannot sit in the same row next to each other?