HW0 (self test)

Due: January 31, Thursday, in class

This assignment is meant to test your level prepration for the course (it is assumed that you have already learned the following material):

1. Let $A = \{1, 2, 3\}, B = \{1, 3, 4\}$. Find $A \cap B$ and $A \cup B$.
2. In how many different ways can you perform each of the following tasks?
   (a) Arrange 5 people in a row.
   (b) Select 4 people from a group of 10 to work on a project.
3. Find the domain and range of the following function
$$f(x) = \frac{1}{1+\sqrt{x}}.$$
4. Solve the following inequalities:
$$-1 < \frac{3-x}{2} < 2, \qquad x^2 < 4$$
5. For which values of p is the following series convergent?
$$\sum_{n=1}^{\infty} \frac{1}{n^p}$$
6. Determine each of the following sums:
$$\sum_{i=0}^{n} \binom{n}{i} a^i b^{n-i} = ?$$
$$\sum_{n=0}^{\infty} r^n = 1 + r + r^2 + \cdots = ? \qquad \text{(assuming } |r| < 1\text{)}$$
$$\sum_{n=0}^{\infty} \frac{A^n}{n!} = \frac{1}{0!} + \frac{A}{1!} + \frac{A^2}{2!} + \frac{A^3}{3!} + \cdots = ? \qquad (A \text{ is any fixed real number})$$
$$\sum_{n=1}^{\infty} \frac{1}{n(n+1)} = \frac{1}{1\times 2} + \frac{1}{2\times 3} + \frac{1}{3\times 4} + \cdots = ?$$
7. Evaluate the following integrals
$$\int_1^{\infty} \frac{2}{x^3}\,\mathrm{d}x, \qquad \int_0^1 x(1-x)^3\,\mathrm{d}x, \qquad \int_0^{\infty} xe^{-2x}\,\mathrm{d}x, \qquad \int_0^{\infty} xe^{-x^2}\,\mathrm{d}x$$