Calculus en kansrekenen

Exam example

It is advised to explain your approach and calculations. You can score a maximum of 100 points. Each question indicates how many points it is worth. The exam is closed book. You are NOT allowed to use a calculator, a computer or a mobile phone. You may answer in Dutch or in English. Please write clearly, and do not forget to put on each page your name and your student number.

1. **(25 points)** The following function is given: $y = \frac{3x^4+1}{x^3}$. Investigate all the points required i.e. domain, parity, limits, extremes, monotonicity and asymptotes and sketch the graph of f. The inflection points and convexity/concavity can be omitted.

2. **(15 points)** Among all rectangles inscribed in a circle of diameter d find the one with the largest area.

3. **(10 points)** Compute the following definite integral: $\int_1^{e^2} x \ln^2 x dx$.

4. **(25 points)** Suppose that a random variable X has the following probability function but *one* of the given probabilities is in error.

X	-3	0	1	3	8
$P(X)$	0.23	-0.39	0.18	0.17	0.13

   Answer the following questions:

   - **(5 points)** Which on of the probabilities is in error and why? Give the correct value and use it in answering the remaining questions.
   - **(5 points)** What is the probability that X is at least 1?
   - **(5 points)** What is the probability that X is no more than 0?
   - **(10 points)** Compute the expected value and standard deviation of X.

5. **(25 points)** A density function is given for a continuous random variable X: $f(x) = \frac{1}{2}e^{-|x+1|}$. Find its expectation and variance.