Eerste deeltoets Wiskunde 1b Tuesday, May 31, 2011, 13:30 – 15:30

It is strongly recommended to explain your approach and calculations. If it is not obvious how your results were obtained (even correct ones) you will not get full points. 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. (15 points) The following function is given: $f(x) = \ln \frac{x^2 3x + 2}{x + 1}$
 - (a) (8 points) Find the domain of f.
 - (b) (7 points) Compute the first derivative of f.
- 2. (10 points) Consider the function $y = x^{x^2}$. Find the first derivative of y, i.e. y'.
- 3. (20 points) Find the following limits:
 - (a) (10 points) $\lim_{x\to 0} \frac{\sin 3x}{\sqrt{x+2}-\sqrt{2}}$ (Do not use L'Hôspital's rule.)
 - (b) (10 points) $\lim_{x\to 0^+} x^{\sin x}$.
- 4. (15 points) Let $s(t) = 16t^2$ be the trajectory of a chandelier ("kroonluchter") which falls from a 400-feet ceiling. Answer the following questions:
 - (a) (4 points) How many seconds do you have to get out of the way of the chandelier (after the moment that it starts falling)?
 - (b) (4 points) If you don't make it, how fast will the chandelier be moving when it hits you?
 - (c) (7 points) How much time has passed until the chandelier achieved the half of that speed (computed in (b))? Where (i.e. at which height) was the chandelier at this moment?
- 5. (15 points) Among all rectangles inscribed in a circle of diameter d find the one with the largest area.
- 6. (25 points) The following function is given: $y = \frac{3x^4+1}{x^3}$. Investigate the behavior and sketch the graph of f.

Tweede deeltoets Wiskunde 1b

Tuesday, July 05, 2011, 13:30 - 15:30

It is strongly recommended to explain your approach and calculations. If it is not obvious how your results were obtained (even correct ones) you will not get full points. 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 computer or a mobile phone; you can only use simple calculators. 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)

- (a) (10 points) Show that function $u=\arctan\frac{y}{x}$ satisfies the Laplace equation i.e. $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$.
- (b) (15 points) The following function of two variables is given: $z = \frac{8}{x} + \frac{x}{y} + y$.
 - i. Find the domain of z.
 - ii. Find relative maximum or minimum values of z.

2. (20 points)

- (a) (10 points) Find the area bounded by the curves $y = e^x$, $y = e^{-x}$ and line x = 1. Make a sketch of the area.
- (b) (10 points) Compute the following integral: $\int_0^{\pi} e^x \sin x dx$.
- 3. (20 points) There were exactly 3 shots fired on a military plain. The probability of the first shot hitting the plain is 0.5, of the second is 0.6, and of the third is 0.8. After being hit by just one shot the plane will go down with probability 0.3, being hit by 2 shots with probability 0.6 and being hit by 3 shots with probability 1. Find the probability of the plane going down after exactly 3 shots.
- 4. (15 points) A machine consists of 100 parts. The probability of a failure for 1 part within one year is 0.01 and the functioning of each part is independent of other parts. Find the probability of the failure of:
 - · exactly 2 parts,
 - 2 or more parts,

within one year.

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.