

**Erasmus School of Economics**  
**Erasmus University Rotterdam**

Math Entrance Exam 26 March 2009

There are two parts:

For **part A** you have to do **eight** problems out of twelve.

You can earn 3 points for each problem.

For **part B** you have to do **one** out of two problems. You can earn 12 points for this problem

If you make more problems than asked for, only **the first eight** problems of part A you do and the **first** problem of part B you do will be considered.

You have to show in which way you get to your final answers.

When the words "Solve", "Calculate " or, "Compute" are used in the problems you have to give an exact answer.

When your result is **eighteen points or more** you have passed the exam. This means you have 6 out of 10 points according to the Dutch grading system. However: to be selected we expect from our IBA candidates minimum **22 points**, this means you have 7 out of 10 points

Please do number your answering pages.

This exam consist out of 3 pages.

**Part A.**

1. Solve the inequality  $\frac{x^2+3x+2}{x+1} \leq 1$
2. Solve the following equations:
  - a.  $\sqrt{x+9} - x = -3$
  - b.  ${}^3\log(6+2x) - {}^3\log(6-x) = 1$       Consider base of log is 3.
  - c.  $x^3 + 8x^2 = 9x$
3. Given are the points A(1,2); P(3,4); Q(4,6) en B(7,10)

An ant walks from A passing P to B.

A spider walks from A passing Q to B.

  - a. Who has the least choices?
  - b. What is the difference between the choices?

4. Given is the function  $f(x) = |2x + 2| - |x - 5|$
- Draw the graph of this function.
  - Solve the equation  $f(x) = 2x + 3$
5. Given is the function  $f(x) = \frac{2x-26}{x+3}$
- Draw the graph of the function
  - Solve the inequality  $0 < f(x) < 3$
6. Calculate the first derivative of the following functions
- $f(x) = 5^{3x+2 \ln x}$
  - $f(x) = (x^5 - 3x^4 + 5x^2 - 2)^{11}$
7. Solve the inequality  $(\frac{1}{4})^{4x+3} \leq (\frac{1}{8}\sqrt[5]{4})^{2x+1}$
8. Given are the following sets:
- $$A = \{x \in \mathbb{N}^+ \mid x \text{ is multiple of } 4 \wedge x < 37\}$$
- $$B = \{x \in \mathbb{N}^+ \mid x \text{ is multiple of } 6 \wedge x < 34\}$$
- Calculate:
- $P(A|B)$
  - $P(B|A)$
9. Given is the function  $f(x) = 5xe^{3x}$
- Point A is on the graph of f. The x-coordinate of A is 3
- Find the equation of the tangent in A on the graph of f.
10. Peter throws a coin 5 times. He writes the outcome as:  
h,h,t,h,t (heads and tails).
- How many different outcome are there?
  - Calculate the probability on 3 times head and 2 times tail
11. Given is the function  $f(x) = \sqrt{x+3}$
- Find the equation of the normal in point A with x-coordinate 6.
- Point A is on the graph of f.
12. Given is the line  $l: x - 3y = 6$
- Draw this line in the x-y plane
  - Find the equation of the line  $m$  perpendicular to  $l$  intersecting  $A(3, -4)$

### Part B

1. Calculate the following integrals:

a.  $\int_{-1}^2 (x^5 - 8x^3 + 7x - 2)^6 (10x^4 - 48x^2 + 14) dx$

b.  $\int_0^2 2^{5x-4} dx$

c. Given are the functions  $f(x) = 2x^3$  and  $g(x) = 10x^2 - 12x$

Calculate the surface areas between the graphs of  $f$  and  $g$ .

2. Given is the function  $f(x) = x^4 - 10x^2 + 9$

a. Calculate the coordinates of the intersection points with the x-axis.

b. Coordinate the extremes of  $f(x)$ .

c. Are these extremes maxima or minima? Explain your answer.

d. Calculate the coordinates of the point(s) of inflection.

Given is the function  $g(x) = x^4 - 9x^2 + 8$

e. Calculate the surface area between the graphs of  $f$  and  $g$ .