

FACULTY OF ECONOMICS AND BUSINESS  
Admission Test Mathematics

1. Expand and simplify by removing parentheses and collecting terms:

$$(2xy - 3x^2)(x + 2y) - (y^2 - 2xy)(2x - y)$$

2. Simplify ( $x$ ,  $y$  and  $z$  are positive constants):

a.  $\frac{(x\sqrt{y})^2 \cdot x^{-1}y^{-\frac{1}{2}}\sqrt{2}}{(2x^{-1})^2\sqrt{2y}}$       b.  $\frac{x^2 + x - 5}{x - 7} - \frac{x^2 - 2}{x - 7} + \frac{-4x + 8}{x^2 - 9x + 14}$

3. Factorize the following expressions completely:

a.  $x^2y^2 - 6xy + 9$       b.  $(a + 5)^3(a + 1)^2 + (a + 5)^2(a + 1)^3$

4. Solve the following equations:

a.  $x^3 \ln x - 4x \ln x = 0$       b.  $-x^2 + 2x + 4 = 0$       c.  $700 \cdot (0.8)^x = 200 \cdot (1.06)^x$

5. Solve the next inequalities:

a.  $\frac{1}{x^2} > \frac{1}{x}$       b.  $8 - 0.1x \leq \frac{2 - 0.01x}{0.2}$

6. Differentiate the following functions, simplify and factorize:

a.  $f(x) = \frac{x^2}{\sqrt{x^2 + 1}}$       b.  $g(x) = (x + 1)^8 \cdot e^{2x}$

7. Find the equation of the tangent line to the curve:  $y = \frac{(2 - x^2)\sqrt{x}}{x}$  at the point where  $x = 4$ .

8. Let  $f(x) = \frac{e^{\sqrt{x}}}{x - 3}$  with domain:  $x \geq 0$  and  $x \neq 3$ . Find both extreme values of  $f$  and classify (maximum or minimum).