

BEEM103 – Optimization Techniques for Economists	Dieter Balkenborg Departments of Economics
Class Exercises Week 1	University of Exeter

Exercise 1 Bring onto common denominator and simplify

$$\frac{1}{x-2} - \frac{1}{x+2}$$

Exercise 2 Bring onto common denominator and simplify

$$\frac{\frac{1}{x^2} - \frac{1}{y^2}}{\frac{1}{x^2} + \frac{1}{y^2}}$$

Exercise 3 Simplify

$$\frac{\sqrt[3]{aa^{1/12}}\sqrt[4]{a^3}}{a^{\frac{5}{12}}\sqrt{a}}$$

Exercise 4 Solve

$$\frac{x-2}{x+3} = \frac{x-4}{x+4}$$

Exercise 5 Solve

$$\frac{\frac{1}{2}K^{-1/2}L^{1/4}}{\frac{1}{4}L^{-3/4}K^{1/2}} = \frac{r}{w} \quad \text{for } L$$

Exercise 6 Simplify

$$a - \frac{a}{\sum_{t=0}^T \beta^t}$$

Exercise 7 Simplify

$$\frac{\ln(x^4 \exp(-x))}{\exp(\ln(x^2) - 2 \ln y)}$$

Exercise 8 Calculate the first and the second derivative of the function

$$y = \sqrt[3]{1-x^3}$$

Exercise 9 Find the peaks and the troughs of the function

$$y = x^3 - 10.5x^2 + 30x + 20$$

Exercise 10 Find the absolute maximum and minimum of the function

$$y = x^3 - 10.5x^2 + 30x + 20$$

- 1) on the interval $1 \leq x \leq 6$
- 2) on the interval $1 \leq x \leq 3$
- 3) on the interval $3 \leq x \leq 4$

Exercise 11 A bus company will charter a bus that holds 50 people to groups of 35 or more. If a group contains exactly 35 people, each person pays £60. In large groups, everybody's fare is reduced by £1 for each person in excess of 35. Determine the size of the group for which the bus company's revenue will be greatest.