

<b>BEE1020 – Basic Mathematical Economics</b>	Dieter Balkenborg, Iannis Krassas
<b>Class Exercises</b>	Department of Economics
<b>Week 18</b>	27/02-03/03/2006 University of Exeter

**Exercise 1** Find the indefinite integral. Check your answers by differentiating.

a)  $\int \frac{1}{x^2} dx$

b)  $\int \left( 3\sqrt{y} + \frac{2}{y^3} + \frac{1}{y} \right) dy$

c)  $\int \sqrt{t} (t^2 - 1) dt$

**Exercise 2** Calculate the area above the horizontal axis and below the graph of the function

$$y = f(x) = 16 - x^4$$

**Exercise 3** Use the substitution  $u = 1 - x$  to find the indefinite integral

a)  $\int \frac{1}{1-x} dx$

b)  $\int \frac{x}{1-x} dx$

Check your answer by differentiating.

**Exercise 4** The demand and, respectively, the supply in a market are

$$Q^d = \sqrt{8 - P} \quad Q^s = \sqrt{P}$$

- Find equilibrium price and quantity exchanged.
- Integrate  $\int \sqrt{8 - P} dP$  using the substitution  $u = 8 - P$ .
- Find consumer- and producer surplus.
- Calculate the own-price elasticity of demand and supply in the equilibrium.

**Exercise 5** Use partial integration to find

a)  $\int x e^{-x} dx$

b)  $\int t \ln 2t dt$

c)  $\int x (x + 1)^8 dx$

**Exercise 6** Demand is given by

$$Q^d(P) = 300 - P^2$$

- a) Find the interval of prices for which demand is positive
- b) Express total revenue  $TR = PQ$  as a function of the price. When is total revenue maximized?
- c) Will a firm always seek to maximize total revenue?
- d) For which price is the own-price elasticity  $ped(P) = \frac{dQ^d}{dP} \times \frac{P}{Q^d}$  equal to -1?
- e) Calculate the inverse demand.
- f) Calculate marginal revenue as a function of the quantity demanded.
- g) Calculate marginal revenue via the formula  $MR = P \left( 1 + \frac{1}{ped(P)} \right)$

**Exercise 7** Discuss the graph of the logistic curve

$$Q(t) = \frac{6}{3 + e^{-4t}}$$

i.e., where is it increasing / decreasing, concave / convex, what are the limits  $\lim_{t \rightarrow \pm\infty} Q(t)$ ?