

**ECONOMICS 331**  
**Mathematical Economics**  
*Kevin Wainwright*

## Homework Assignment 6

1. You are an assembler of specialty computer terminals with a modest amount of monopoly power. Suppose that your average revenue per unit depends on how many terminals per day you wish to sell, and is given by

$$AR(y) = -y^3 + 12y^2 - 30y + 1000$$

where  $y$  is sales per day. Suppose further that your average cost of production is given by

$$AC(y) = 2y + 1000 - \frac{100}{y}$$

Notice that your total costs are negative if you choose to produce nothing. This is because you receive a grant from the government for setting up in Surrey, B. C.

- (a) Write out an expression for your profits as a function of output,  $y$ .
- (b) Determine the most profitable level of output. Show that this output level does indeed lead to a maximum rather than a minimum by checking the second order conditions.

2. Given the general function  $y = f(x)$  and the following conditions

$x = 0$	$f(x) = 0$	$f' = 0$	$f'' > 0$
$0 < x < 1$		$f' > 0$	$f'' > 0$
$x = 1$		$f' > 0$	$f'' = 0$
$1 < x < 2$		$f' > 0$	$f'' < 0$
$x = 2$		$f' = 0$	$f'' = 0$
$2 < x < 3$		$f' > 0$	$f'' > 0$
$x = 3$		$f' > 0$	$f'' = 0$
$3 < x < 4$		$f' > 0$	$f'' < 0$
$x = 4$		$f' = 0$	$f'' < 0$
$4 < x \leq 5$		$f' < 0$	$f'' < 0$

Graph  $f(x)$  over the range 0 to 5. Label and identify all critical points.

**The following questions are based on chapters 10 of the textbook.**

3. If  $f(x) = \ln(3x^2 + e^{2x})$  find  $f'(x)$
4. Suppose that the value of a stand of trees increases according to the following function

$$V(t) = 265e^{(75-40/t)}$$

If the market rate of interest is 10%, when should the trees be harvested in order to maximize the present value of the stand?