MATH 1401A **Term test #4** **22 March 2013**

Maximum score: 42 marks

****

Non-programmable calculators are permitted. This test is **closed book**. **Please show your work!**

Supply your answers on this sheet, but TA's have extra paper if you need it.

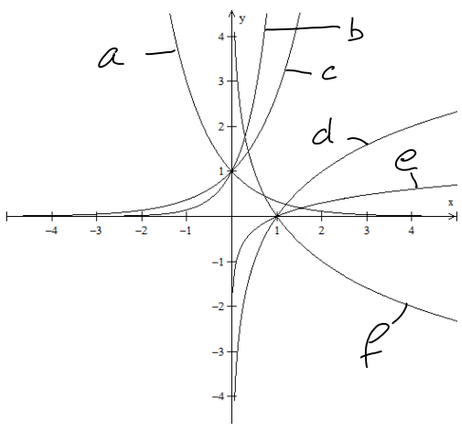
PLEASE PRINT _____ _____

First name Last name Student number

1. The price of a monopoly's product is set by the following inverse demand function $p = -2q + 208$. The Total Cost is given by $TC = f(q) = 2q^2 + 16q + 305$
   a. [1] Determine the rule for the profit Π.
   b. [1] Determine the value of q for which Π is maximized.
   c. [1] Determine the maximum profit.
   d. [2] Show that at that maximum point, *MR* = *MC*

2. [4] Determine the rule that describes the profit Π for the case of a firm for which $p = \bar{p} = 156$ (i.e. perfect competition) and $TC = f(q) = 9q^2 + 48q + 1200$. Tidy up the result. **Clearly** show that the maximum profit occurs for a value of q=6. (i.e. show how one arrives at q=6 and show that a maximum is indeed obtained).

3. [3] Consider the diagram and fill in the blanks



$y = \log x$ corresponds to curve ___

$y = \log_2 x$ corresponds to curve ___

$y = \log_{0.5} x$ corresponds to curve ___

$y = e^x$ corresponds to curve ___

$y = 7^x$ corresponds to curve ___

$y = (\frac{1}{3})^x$ corresponds to curve ___

4. [2+2+2] Solve for x:

   a. $\left(\frac{1}{8}\right)^{7-4x} = 128$

   b. $\log_2(x^2 - 17) = 6$

   c. $\log 100000 = 3x - 1$

MATH 1401A **Term test #4** **22 March 2013**

Maximum score: 42 marks

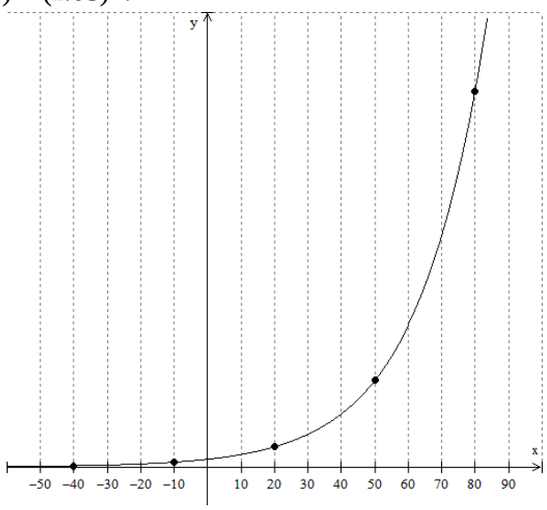
****

5. Consider the graph of the exponential function $f(x) = (1.05)^x$.

   a. [4] Fill in the table

x	*y*	**Growth Rate***
–40		
–10		
20		
50		
80		

* Compute the Growth Rate between –40 and –10, –10 and 20, etc....



   b. [2] Using an appropriate value for the parameters *b* and *d* that enter in the formula for *G.R.*, compute *G.R.* and compare with the results obtained in the table.

   c. [2+2] Fill in the blanks

      i. The sequence in column '*x*' of the table is a _____ sequence, with a common _____ of _____.

      ii. The sequence in column '*y*' of the table is a _____ sequence, with a common _____ of _____.

6. **Simplify**.

   a. [3] $\left(\dfrac{\log_3\left(3^{2n}\right)+\log_3\left(3^{6n}\right)}{\log 1000 - \log 10} \right)^3$

   b. [3] $\dfrac{\left(a^{3x+5}\right)\left(a^{-5x-1}\right)}{\sqrt{a^{6+2x}}}$

7. Differentiate (DO NOT SIMPLIFY):

   a. [3] $f(x) = (3^x + 3x^4)^3 \cdot \log_e(x^2+5)$

   b. [3] $f(x) = \sqrt{e^x - 5\log_5(2x+3)}$

8. [2] Determine whether the following are arithmetic or geometric sequences, or neither.

   a. $7, \frac{7}{2}, 0, -\frac{7}{2}, -7, \ldots$ This sequence is _____

   b. $2, \frac{3}{2}, \frac{9}{8}, \frac{27}{32}, \ldots$ This sequence is _____