

Simon Fraser University
Department of Mathematics
Burnaby Campus

MATH 157-3, Summer 2006
Midterm 1
June 7th, 2006, 11:30 – 12:20

Last Name (please print): _____

First Name (please print): _____

Student Number: _____

Instructor: P. Menz

Instructions:

9. Try your Best!

1. DO NOT OPEN THIS BOOKLET UNTIL TOLD TO DO SO.
2. Fill in the above box.
3. This exam contains 7 pages with a total of 6 questions. Once the exam begins please check to make sure your exam is complete.
4. SHOW ALL YOUR WORK!
5. If you run out of space in a problem, use the space on the back of the previous page and clearly indicate where the solution continues.
6. **Only** scientific, non-programmable calculators with no differentiation and integration capabilities are allowed.
7. No book, paper, or device, other than the usual writing instruments, this booklet and an acceptable calculator, shall be within reach of a student during the examination.
8. During the examination, speaking to, communicating with, or deliberately exposing written papers to the view of other examinees is forbidden.

Do not write in this table!	
Question	Marks
1	/4
2	/4
3	/6
4	/4
5	/8
6	/4
Total	/30

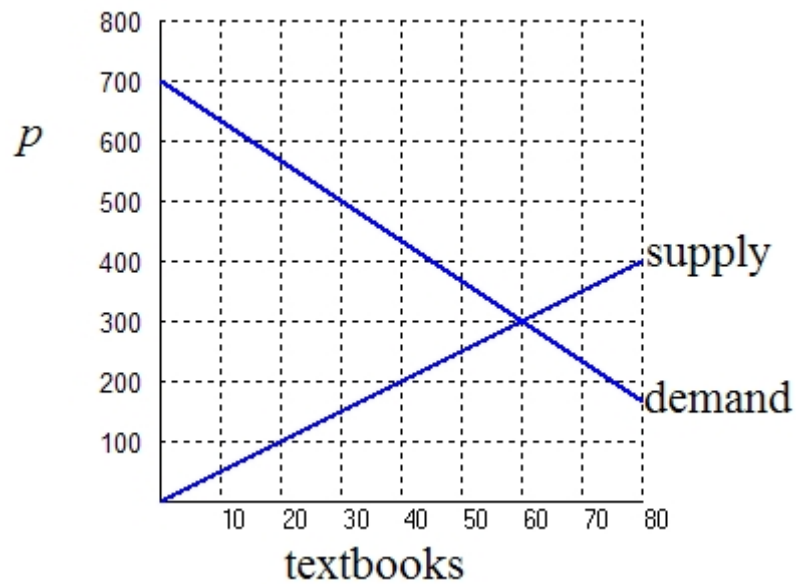
1. Answer **T** (true) or **F** (false) in the boxes provided or leave the box blank. No explanation is necessary. Every correct answer will receive ½. **[4 marks]**



- a) ☐ Revenue is defined as profit times quantity.
- b) ☐ The break-even point indicates when there is no profit.
- c) ☐ One of the properties of the logarithm is $\log_b xy = \log_b x + \log_b y$ for any base b and any real numbers x and y .
- d) ☐ The trigonometric sine function is defined by $\sin(\theta) = \frac{y}{\sqrt{x^2 + y^2}}$, where x is the adjacent side and y is the opposite side.
- e) ☐ Provided the limit exists, $\lim_{x \rightarrow a} f(x) = L$ if and only if $\lim_{x \rightarrow a^+} f(x) = L = \lim_{x \rightarrow a^-} f(x)$ for a real number L .
- f) ☐ All polynomial functions are continuous over all real numbers.
- g) ☐ $\frac{f(b) - f(a)}{b - a}$ is the slope of the secant line through the points $(a, f(a))$ and $(b, f(b))$.
- h) ☐ The instantaneous rate of change of $f(x)$ at $x = a$ is given by $\lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$.

2. The graphs of the supply and demand equations for calculus textbooks is given below, where the price p is in dollars and q is the number of textbooks.

[4 marks]



a) What is the demand equation?

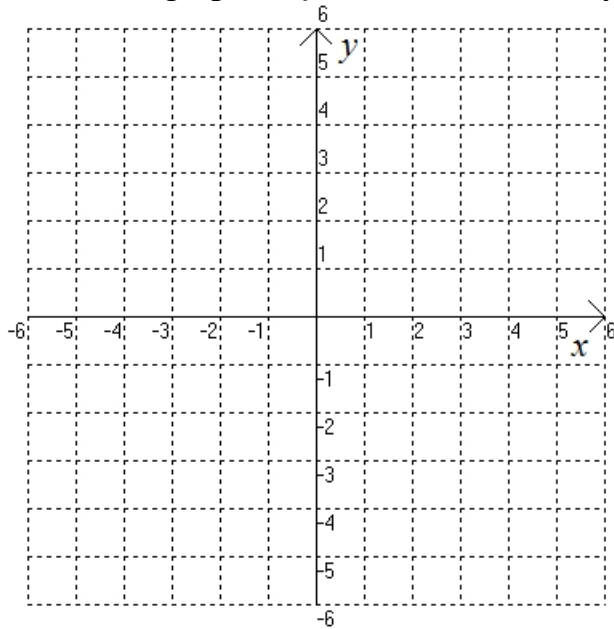
b) What are the equilibrium price and quantity?



3. Let $f(x) = \begin{cases} (x+4)^2 + 2, & -6 \leq x < -4 \\ \sqrt{-x}, & -4 \leq x \leq 0. \\ 2 \sin\left(\frac{\pi}{3}x\right), & 0 < x < 6 \end{cases}$ [6 marks]



a) Sketch the graph of f in the coordinate system below.



b) What is the range of f ?

c) Is f continuous at $x = -4$? Why or why not?

4. A sample of radon-222 has a mass of 800 mg. After three days the sample decayed to 60% of its original amount.

[4 marks]

a) Write an exponential function that models this.



b) Approximately how much of radon-222 is present after 12 hours to the nearest milligram?

5. Find the following limits, if they exist. **[8 marks]**

a) $\lim_{x \rightarrow 2} \frac{x^2 - 2}{x^3 + 2}$



b) $\lim_{x \rightarrow 3^-} \frac{|x - 3|}{x - 3}$

c) $\lim_{x \rightarrow 4} \frac{x^2 - 16}{4 - x}$

d) $\lim_{x \rightarrow -\infty} \frac{2 + 5x - 6x^4}{3x^2 + 2x^4}$

6. Use the definition of the derivative to find the derivative of $f(x) = x^2 - 7$.
[4 marks]

