EXAM 2 RE-TAKE—Friday, November 12, 2004

Do the easier questions first. Show all your work. GOOD LUCK!

“My signature below indicates that I understand that this score will replace my original score regardless of which is higher.”

Signature: __________________________________________ Score: ____/100

Escape hatch: If you print “DO NOT GRADE” below, I will discard this exam without grading it and you will retain your original score.
1. (20 points) Suppose the following is the graph of a moving object’s velocity \( v \), in feet per second, as a function of time \( t \), in seconds.

![Graph of velocity as a function of time]

Find each of the following using the graph of \( v \). Write down the mathematical expression for the quantity you are calculating for each. Include units in your answer.

(a) What is the displacement of the object from \( t = -2 \) to \( t = 1 \)?

(b) What is the total distance traveled by the object (without regard to direction) from \( t = -2 \) to \( t = 1 \)?

(c) What is the displacement of the object from \( t = 6 \) to \( t = 7 \)?

(d) What is the total distance traveled by the object (without regard to direction) from \( t = 6 \) to \( t = 7 \)?

(e) What is the displacement of the object from \( t = 4 \) to \( t = 6 \)?

(f) What is the total distance traveled by the object (without regard to direction) from \( t = 4 \) to \( t = 6 \)?
2. (25 points) Suppose that \( D(q) = 2500 - 0.01q^2 \) is the demand function for a certain model of flat screen TV.

Use the Excel file Integrating.xls to answer the following questions. For each, write down the mathematical expressions for what you are calculating. Include units with your answers.

(a) Find the total possible revenue, \( TPR \).

(b) Suppose that \( q_{\text{sold}} = 300 \) TVs are sold.

i. Compute the revenue, \( R(300) \).

ii. Compute the consumer surplus, \( CS(300) \).

iii. Compute the lost revenue from units not sold, \( NS(300) \).
3. (30 points) Consider the function \( f(x) = 9 - x^2 \). We wish to approximate the integral \( \int_{-2}^{1} 9 - x^2 \, dx \) (the area under the curve \( y = 9 - x^2 \) from \( x = -2 \) to \( x = 1 \)) using the midpoint sum \( S_6 \).

(a) Carefully sketch the graph of \( f \). (It is an upside-down parabola with vertex \((0, 9)\) and \(x\)-intercepts \((-3, 0)\) and \((3, 0)\).)

(b) Find the length, \( \Delta x \), of each subinterval.

(c) Find the endpoints, \( x_0, x_1, x_2, x_3, x_4, x_5, x_6 \), of each subinterval.
(d) Find the midpoint, $m_1, m_2, m_3, m_4, m_5, m_6$, of each subinterval.

(e) Sketch each approximating rectangle on the graph.

(f) Find the height of each rectangle. *Use the correct mathematical symbols for what you are computing.*

(g) Find the area of each rectangle. *Use the correct mathematical symbols for what you are computing.*

(h) Find $S_6$. *Use the correct mathematical symbols for what you are computing.*
4. (25 points) A farmer wishes to enclose a rectangular field. One of the sides (running north-south) is along a river and doesn’t need fencing. (So he will be fencing one north-south side and two east-west sides.)

Make a table in a blank Excel worksheet with the columns “length of each north-south side,” “length of each east-west side,” “total length of fencing,” and “area of field.”

(a) Suppose that the farmer has 2145 feet of fencing and wishes to maximize the area of the field. Use Solver to determine the dimensions of the field that will accomplish this. Leave this solution in the table to be copied to disk. Also write the dimensions below.

(b) Make another copy of your table. Now assume that the farmer must enclose a field whose area is exactly 300,000 square feet. He wishes to minimize the amount of fence used. Use Solver to determine the dimensions of the field that will accomplish this. Leave this solution in the second table to be copied to disk. Also write the dimensions below.