MATH 1090 SECTION 2 - SUMMER 2007 - MIDTERM

You have an hour and 50 minutes to complete this test. Show all your work. Calculators are NOT allowed.

Each of the following 8 questions is worth 15 points. Together, they are worth a total of 120 points. The maximum grade is 100 points. You may do part of a problem to get partial credit.

Student Number: _____

(1) Solve:

   (a) (8 points) $4 \leq 3 - 2y$

   (b) (7 points) $\dfrac{x+3}{x} = \dfrac{2}{5}$

(2) (15 points) Solve: $\frac{1}{2}x^2 + 4x - 7 = 0$

(3) (a) (8 points) Find the slope-intercept equation of the line which passes through the points $(2, 1)$ and $(4, -7)$.

(b) (7 points) Find the line perpendicular to the line in 3a and which goes through the point $(4, 0)$.

(4) Consumers will buy 30 units of a product when its price is $8 and 24 units when its price is $14.

    (a) (10 points) Find the demand equation assuming it's linear (the price as a function of the demand).

    (b) (5 points) What's the price per unit when the demand is 27 units?

(5) Your favorite artist releases a new CD. The demand function is $p = f(q) = 4.5 - 0.5q$.

Where p is the price per CD (in dollars) when q (millions of) CDs were sold.

(a) (6 points) Write the revenue R as a function of q.

(b) (9 points) Find the number of CDs to sell that will maximize the total revenue and the maximum revenue possible.

(6) A company's margin of profit is: $\frac{\text{net income}}{\text{net sales}}$.

    (a) (4 points) Last year's net income was \$2000 and the price per unit was \$3. Express last year's margin of profit as a function of q, the number of units that were sold last year.

        Last year's total sales =

        A = last year's margin of profit =

    (b) (5 points) This year's net income was \$10,000 and the price per unit increased by \$2 from last year.Suppose the number of units sold this year was 2000 more that last year. Express this year's margin of profit as a function of q, the number of units sold last year (Hint: first express the number of units sold this year, then find the price per unit this year, then continue to find the margin of profit this year).

        This year's price per unit =

        This year's number of units sold =

        This year's net sales =

        This year's net income =

        B = this year's margin of profit =

(c) (3 points) Suppose this year's margin of profit is $\frac{3}{2}$ times last year's margin of profit. Use (6a) and (6b) to write an equation in the variable q which expresses this.

(d) (3 points) How many units did the company sell last year? How many this year?

(7) Let $f(x) = -2x^2 + 5x - 2$.

    (a) (4 points) Does it open up or down? Find the vertex.

    (b) (4 points) Find the y-intercept and the x-intercepts if they exist.

(c) (3 points) Graph $f(x)$

(d) (5 points) What's the domain of definition of the function $h(x) = \sqrt{f(x)} = \sqrt{-2x^2 + 5x - 2}$. Sketch your answer on the real line.

(8) Let $f(x) = 3x^2 + 2x + 1$ and $g(x) = \sqrt{x}$.

(a) (8 points) What are the functions $h(x) = g \circ f(x) = g(f(x))$ and $k(x) = f \circ g(x) = f(g(x))$ (do <u>not</u> simplify your answer).

(b) (7 points) What is $f(x + h)$? What is the difference quotient? $D(x, h) = \frac{f(x+h) - f(x)}{h}$? Simplify your answers.