

MATH 1090 SECTION 2 - SUMMER 2007 - PRACTICE MIDTERM

You have two hours 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: $\frac{4}{x-3} + \frac{2}{3} = \frac{6}{5} - \frac{12}{15-5x}$

(2) Solve: $\frac{1}{2}x^2 - \frac{2}{3}x + \frac{2}{5} = 0$

(3) (a) Find the slope-intercept equation of the line which passes through $(2, 9)$ and is parallel to $y = 2x + 1$.

(b) Find the line perpendicular to the line in (3a) and which passes through $(5, 2)$.

(4) The cost per unit depends on the number of units which are manufactured. Suppose it costs \$150 to manufacture 300 units and \$160 to manufacture 400 units.

(a) Find the cost per unit in each case.

(b) Suppose the cost per unit is a linear function of the number of units manufactured. Find the slope - intercept form of this function.

(c) Find the cost per unit when 350 units are manufactured.

- (5) A gas station uses the following demand function: $p = 8 - 0.2x$ Where x is the number of (thousands of) gallons sold per day and p is the price per gallon (in dollars). Find the number of gallons to sell to get a maximum revenue. Find the optimal price per gallon and the maximum revenue.

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

(a) A home business for quilts sold 400 quilts last year at a price of \$13 a unit. If z denotes last year's net income, express last year's margin of profit in terms of z .

(b) This year, the price increased by \$2 and still 400 quilts were sold. The net income grew by \$100. Express this year's margin of profit in terms of z . (Hint: First write this year's income in terms of z).

(c) Suppose this year's margin of profit was 4% higher than last year's. Use (6a) and (6b) to express this.

(d) What was last year's net profit? What was this year's net profit?

(7) Let $f(x) = 2x^2 + 2x - 4$.

(a) Does it open up or down?

(b) Find the vertex and write the equation of the axis of symmetry.

(c) Find the y -intercept. Find the x -intercepts if they exist.

(d) Graph $f(x)$

(e) What's the domain of definition of the function $h(x) = \sqrt{-f(x)} = \sqrt{-2x^2 - 2x + 4}$.

Sketch your answer on the real line.

(f) Find the vertex of $g(x) = x^2 - 9x + 20$.

(g) How would you need to translate (shift) f 's graph so that its vertex would overlap g 's vertex. What is the function of this new graph?

(8) Let $f(x) = \frac{1}{x^2}$ and $g(x) = 2x^2 + 3x + 5$.

(a) What are the functions $h(x) = g \circ f(x) = g(f(x))$ and $k(x) = f \circ g(x) = f(g(x))$ do not simplify your answer. Is $h(1) = k(1)$?

(b) What is $f(x + h)$? What is the difference quotient? $D_1(x, h) = \frac{f(x+h)-f(x)}{h}$? do not simplify your answer.

(c) What is $g(x + h)$? What is the difference quotient? $D_2(x, h) = \frac{g(x+h)-g(x)}{h}$? Simplify your answers.