Name _____ Section _____

Student Number _____

Math 120F (Midterm-Part II)
Autumn 1997

!!!!! READ READ READ !!!

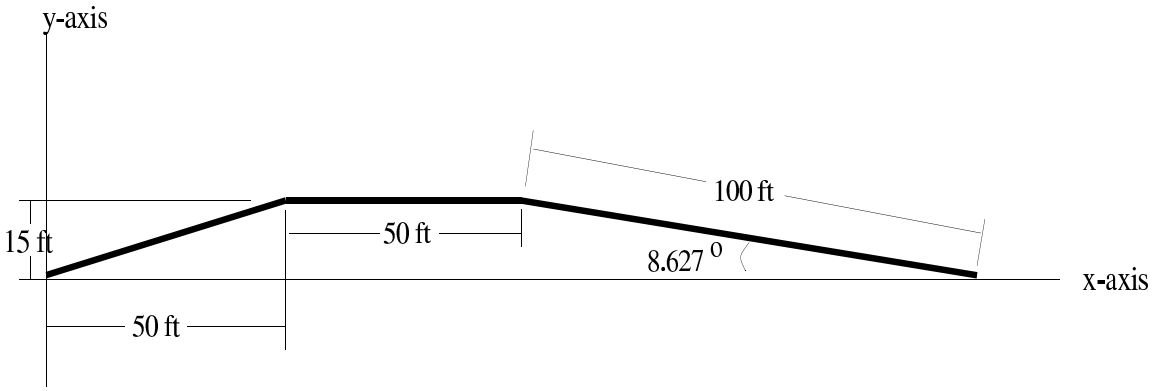
Instructions:

- **Show your work; no credit for answers only.**
- **Make sure your exam has 6 pages.**
- **Write your name on the cover page. Include your student number on every page.**
- **If you are using a graphing calculator, "zooming in" to find a value on a function graph will not be sufficient justification for any answer on this exam. You are free to use the calculator to check yourself.**
- **When in doubt, ask a question by raising your hand. I will come around to help as soon as possible.**
- **Good Luck!**

Part II (45) _____

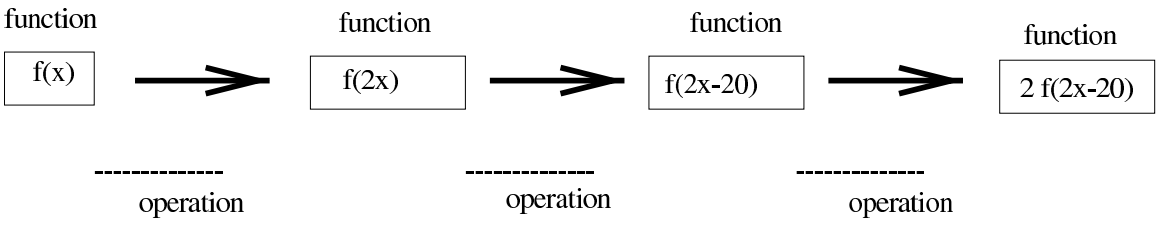
Extra Credit (5) _____

1. (21 points) Below is the graph of a multipart function $y = f(x)$; the graph consists of the three dark line segments.



(a) (8 pt) Find the multipart rule for the function $y = f(x)$ whose graph is given. Make sure to clearly indicate the domain for each portion of the multipart rule. Also determine the range of the function.

(b) (6 pt) Fill in the blanks with the type of shifting or dilation (vertical or horizontal) required to go from $y = f(x)$ to $y = 2f(2x - 20)$. Be specific; for example, if horizontal shifting is involved, you need to indicate by how much you horizontally shift, etc.



Problem 2 continued.

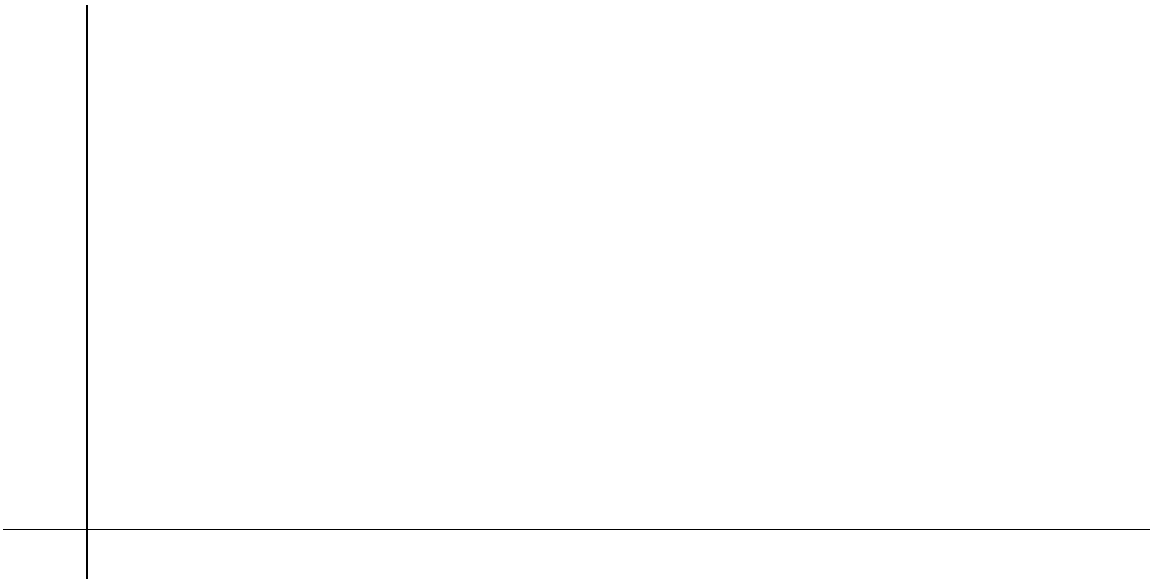
(c) (6 pt) Find the multipart rule for the NEW function $y = 2f(2x - 20)$. Make sure to clearly indicate the domain for each portion of the multipart rule.

(d) (1 pt)What is the range of $y = 2f(2x - 20)$?

2. (24 points): The temperature in a room varies sinusodially. Assume that the lowest temperature is 12° C and occurs 4 hours after midnight ($t = 4$), then the temperture rises and reaches a maximum of 30° C at 12 hours after midnight ($t = 12$). Let $d(t)$ be the function giving the room temperature at time t hours after midnight.

   (a) (2 points) Find the mean and amplitude for $d(t)$.

   (b) (6 points) In the coordinate system below, include each of the following:
   - Labeled axes with units; assume a domain of $0 \leq t \leq 30$.
   - Maximum and minimum points on the graph with coordinates
   - The mean line $y = D$.
   - The lines $y = D \pm A$.



Problem 6 continued.

(c) (2pt) Calculate the period B and a phase shift C:

(d) (4 pt) Sketch the graph in the coordinate system above.

(e) (4 pt) Write down a formula for $d(t)$ that involves no unknown constants.

(f) (6 pt) During the time period $0 \leq t \leq 30$, when will the temperature be 25^o C?

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(EXTRA CREDIT)

(5 points) Consider the shaded region pictured. Assume both circles have radius 1. The two points have coordinates $A = (0, 1/2), B = (0, -1/2)$. Find the area of the shaded region.