

# MATH 120: Midterm 1

Last name: \_\_\_\_\_

First name: \_\_\_\_\_

February 1

V number: \_\_\_\_\_

Lecturer: Jephian Lin  
[A01 - CRN 21993]  
Contents: cover page,  
**4 pages** of questions  
Duration: **50 minutes**

Page	Points	Score
1	8	
2	6	
3	7	
4	7	
Total	28	

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**Do not open this packet until instructed to do so.**

## Instructions:

- Enter your Name and V number before you start.
- The only calculator permitted is the Sharp EL-510R, EL-510RN or EL-510RNB. No other electronic devices are permitted.
- Any work necessary to arrive at an answer must be shown on the examination paper. Marks will not be given for final answers that are not supported by appropriate work.
- Clearly indicate your final answer to each question either by **underlining it or circling it**. If multiple answers are shown then no marks will be awarded.

1. Let  $A = (3, 4)$  and  $B = (9, -4)$  be two points on the coordinate system.

(a) [2pt] Find the midpoint between  $A$  and  $B$ .

(b) [2pt] Find the distance between  $A$  and  $B$ .

(c) [2pt] Find the slope of the line passing through both  $A$  and  $B$ .

2. Fill the blanks.

(a) [1pt] The equation  $|x - 5| = 4$  means on the real line, the distance between the point  $x$  and the point \_\_\_\_\_ is equal to \_\_\_\_\_.

(b) [1pt] The equation  $(x - 5)^2 + (y - 3)^2 = 49$  means on the coordinate system of two variables, the distance between the point  $(x, y)$  and the point \_\_\_\_\_ is equal to \_\_\_\_\_.

3. Let  $L_1$  be the line with equation  $y = 5x + 3$ .

(a) [1pt] Find the slope of  $L_1$ .

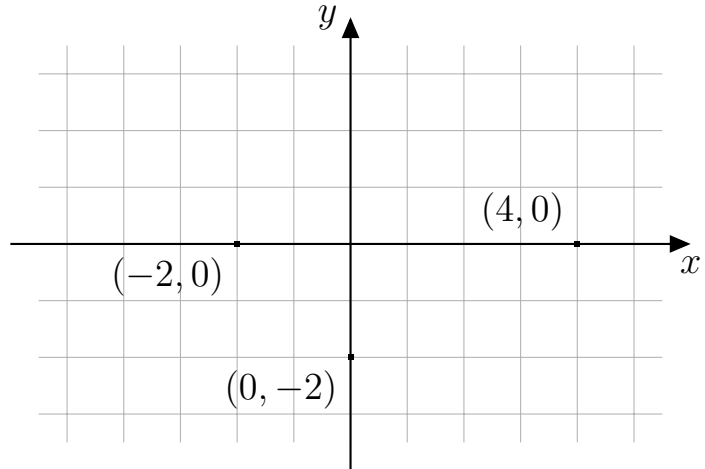
(b) [2pt] Find the equation of a line that is parallel to  $L_1$  and passes through the point  $(2, 2)$ .

(c) [1pt] Find the slope of a line that is perpendicular to  $L_1$ .

(d) [2pt] Shift the line  $L_1$  to the right by 3 and upwards by 5. What is the equation of this new line?

4. Let  $f(x) = |x - 1| - 3$ .

- (a) [2pt] Using the grid on the right to plot the graph of  $f$ . [Hint: The graph will pass through the three points marked on the grid; plot more points to make sure your answer is correct.]



- (b) [1pt] Find the value(s) of  $b$  such that  $f(b) = 0$ .
- (c) [1pt] Observe the graph in (a) and find the interval(s) where  $f$  is decreasing.
- (d) [2pt] Solve  $|x - 1| - 3 < 0$  and write your answer in the interval notation. [You may either do it algebraically or solve by the graph you plotted in (a).]
- (e) [1pt] Does this function have an inverse? Give a brief reason for your answer.

5. [2pt] Let  $f(x) = x^2 + x$  and  $g(x) = x + 1$ . Find the formulas of  $f(g(x))$  and  $g(f(x))$ .

6. [2pt] Let  $h(x) = (2x + 1)^4 - (2x + 1)^3$ . Find two functions  $f(x)$  and  $g(x)$  such that  $h(x) = f(g(x))$ . [There are many correct answers; you just need to provide one.]

7. [3pt] Let  $f(x) = \frac{x-2}{3}$ . Find its inverse function  $f^{-1}(x)$ .