Math 123 Exam 1A

October 7, 2013 Professor Ilya Kofman

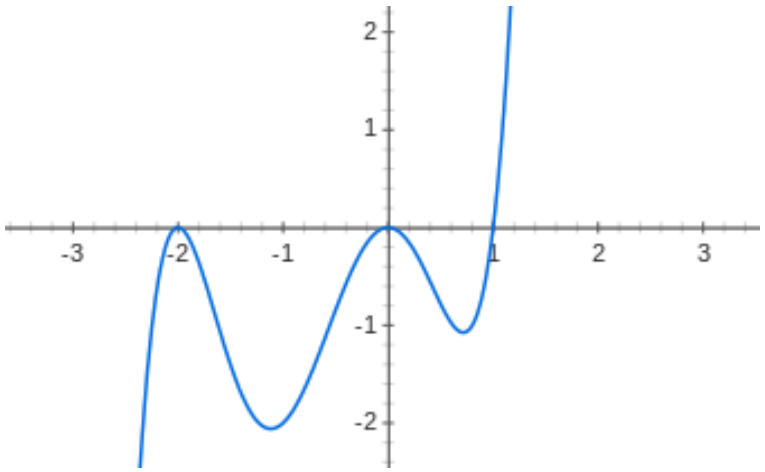
NAME: _____

1. (*16 points*)

(a) Find the equation of the line passing through points $(3, 6)$ and $(7, 3)$. Write your final answer in the slope-intercept form $y = mx + b$.

(b) Let $f(x) = -3x^2 + 18x - 23$. Does $f(x)$ have a maximum or minimum? Find this max or min value, and find where it occurs.

2. (*16 points*) Let $y = f(x)$ be the graph given below.



(a) Write the values $f(-2) =$, $f(-1) =$, $f(1) =$.

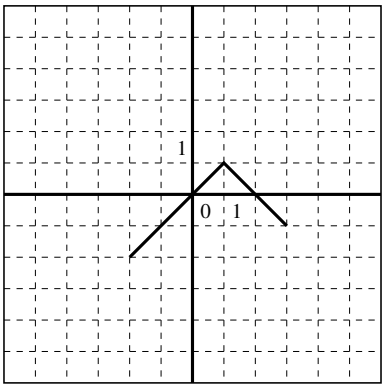
(b) For which x will $f(x) = -2$? (Give an approximate answer if necessary.)

(c) What are the max and min values of $f(x)$ on the domain $-2 \leq x \leq 1$?

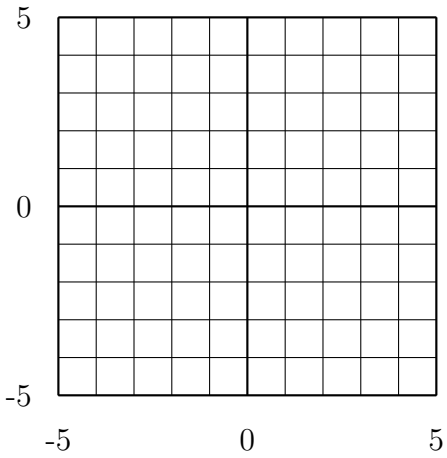
(d) On which intervals for $x \leq 0$ is $f(x)$ decreasing?

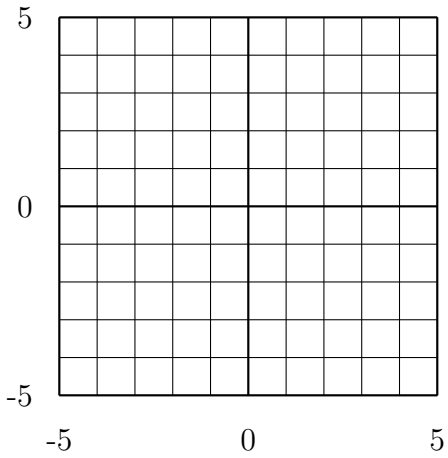
(e) Find the average rate of change of $f(x)$ on the interval $[-2, -1]$.

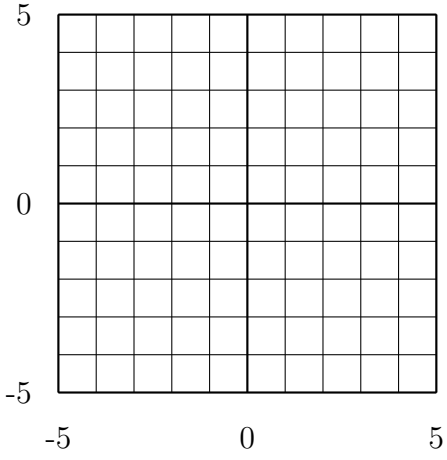
3. (*16 points*) The graph of $y = f(x)$ is as shown.

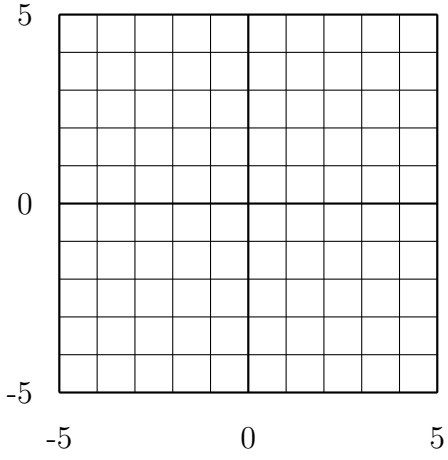


Sketch the graphs of the following functions:
(1) $y = f(x) - 2$ (2) $y = f(x - 2)$ (3) $y = -f(x)$ (4) $y = 3 - f(x)$.





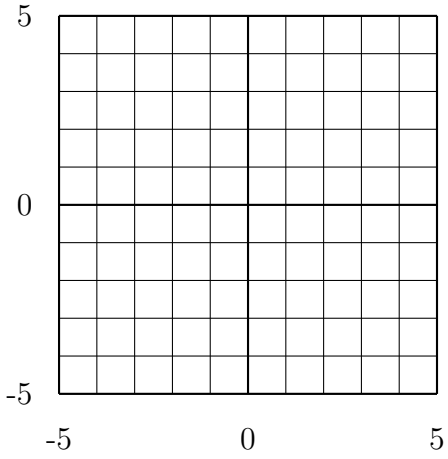




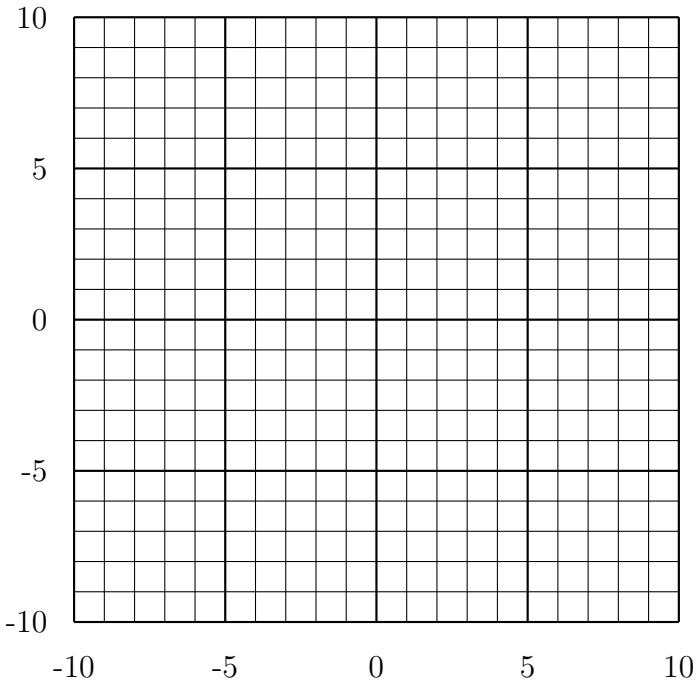
4. **(a)** (*10 points*)

$$f(x) = \begin{cases} -2 - x & \text{if} \quad x < -1 \\ x + 3 & \text{if} \quad x \geq -1 \end{cases}$$

Sketch graph of $y = f(x)$.



(b) (*12 points*) Convert the function $f(x) = -2x^2 - 12x - 19$ to standard form $y = a(x - h)^2 + k$ and sketch its graph.



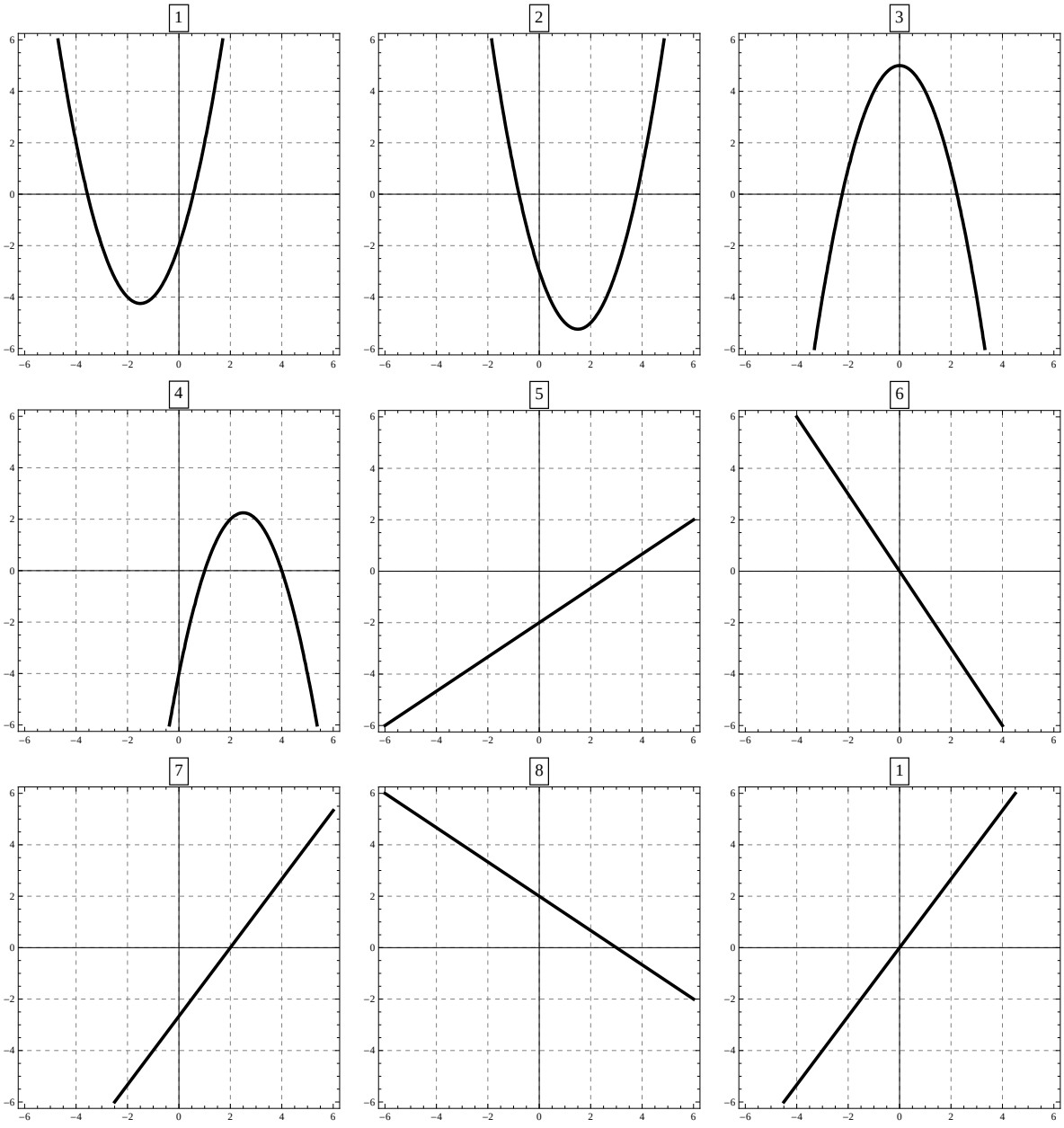
5. (*12 points*) Match the equations with their graphs.

(a) $y = 5x - x^2 - 4$ Graph: _____

(b) $4x - 3y = 8$ Graph: _____

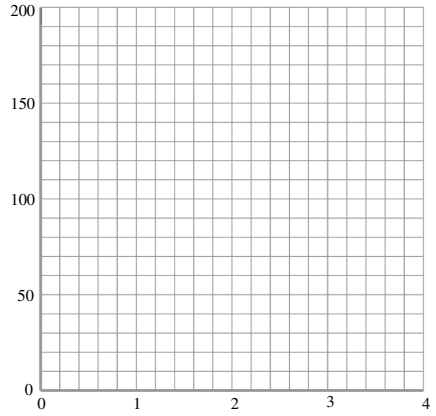
(c) $y = x^2 - 3x - 3$ Graph: _____

(d) $2x + 3y = 6$ Graph: _____



6. (*20 points*) Train 1 leaves NYC toward Boston at 9am at 40 miles per hour. Train 2 leaves Boston toward NYC, which is 200 miles away, at 10am at 60 miles per hour.

(a) On the axes below, sketch the corresponding lines. Measure distance from NYC, and let $t = 0$ be 9am.



(b) Using the equations of the lines, compute at what time the trains meet.

(c) Using the equations of the lines, compute how far from NYC do they meet.

7. (*16 points*) A tour company has a ticket price that goes down \$2 for every additional person who signs up for a group trip. So if n is the number of people that go on the trip, they charge, per person, $p(n) = 52 - 2n$ dollars.

(a) Find a function that models the revenue $R(n)$ in terms of the number n of people on the trip.

(b) How many people maximize the revenue for the tour company? Justify.