

YOUR NAME: \_\_\_\_\_

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Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. (a) Find the  $y$ -intercept of the straight line having slope  $m = -2.3$  and passing through the point  $(3.2, -1.5)$ .

- (b) Find an equation for the straight line that passes through  $(7, 4)$  and is perpendicular to the line passing through the points  $(-3.6, 2.5)$  and  $(2.4, -1.6)$ .

2. Between the ages of 7 and 11 years, a certain boy grows 2 inches taller each year. At age 9, he is 48 inches tall.
- (a) Explain why during this period the function giving the height of the boy in terms of his age is linear. Identify the slope of this function.
- (b) Use a formula to express the height of the boy as a linear function of his age during this period. Be sure to identify the meaning of the letters used.
- (c) What is the initial value of the function of the previous part?
- (d) Studying the graph of the boy's height as a function of his age from birth to age 7 reveals that it is increasing and concave down. Does this indicate that his actual height at birth was larger or smaller than the answer to the previous part? Please, explain your reasoning.

3. A gambler is steadily losing money. The following table shows the money  $M$ , in dollars, left in his wallet after  $g$  games of chance.

$g$	5	12	14	15
$M$	425	320	290	275

- (a) Show that the data are linear.
- (b) Use a formula to express  $M$  as a linear function of  $g$ .
- (c) How much is the gambler losing on each game?
- (d) How much money did the gambler start with?
- (e) How many games can he play before he runs out of money?

4. Improved agricultural practices, including better utilization of fertilizers and use of improved plant varieties, have resulted in increased rice yields in Asia. The table shows the average yield  $Y$ , in tons per hectare, as a function of the number of years  $y$  since 1980:

$t$	5	10	15	20	25
$Y$	3.32	3.61	3.73	3.95	4.11

- (a) Are the data of  $Y$  vs.  $t$  linear?
- (b) One study used a linear function to model  $Y$  vs.  $t$ . Find such a model. Make sure to explain the meaning of your variables.
- (c) What is the meaning of the slope of your linear model?
- (d) Use the model to calculate  $Y(30)$  and explain what your answer means in practical terms.
- (e) What yield does your model estimate for 2025?
- (f) The 1993 report of the International Rice Research Institute predicted that rice requirements in Asia would grow exponentially. If the requirements in 2025 are 6.44 tons per hectare, will rice production in 2025 meet those requirements?

5. You have space in your garden for 55 small flowering bulbs. Crocus bulbs cost \$ 0.35 each and daffodil bulbs cost \$ 0.75 each. Your budget allows you to spend \$ 25.65 on bulbs. How many crocus bulbs and how many daffodil bulbs can you buy?