Linear Function Problems — 01/28

Problem 1. Does the table below represent a linear function?

x	1	2	5	6
y	7	4	-5	-8

If y is a linear function of x, find the function. If it is not, explain why.

Problem 2. A company is examining their operating costs. They observe that the amount they spend making each item they sell is approximately the same—roughly \$8. The company also has to pay \$7,500 in rent for their warehouse used in manufacturing.

(a) Explain why the total cost of production, C, is a linear function of the number of items they produce, q. Find $C(q)$.

(b) Find and interpret the slope of $C(q)$.

(c) Find and interpret the y-intercept of $C(q)$.

(d) What is the cost of producing 450 items?

Problem 3. A statistician finds that the population of a town t years after its founding in 1980 is given by $P(t) = 200t + 8500$.

(a) What kind of model did the statistician use? Justify your answer.

(b) Find and interpret the average rate of change for $P(t)$.

(c) Find and interpret the y-intercept for $P(t)$.

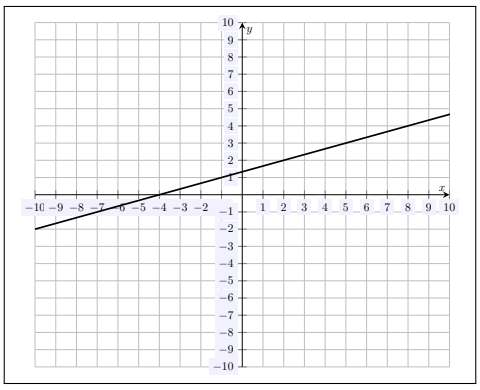
(d) Find and interpret $P(20)$.

(e) According to this model, what is the year that the town will be 100,000 people?

Problem 4. Find the average rate of change for $f(x) = x^2 - 3x + 5$ between $x = -1$ and $x = 5$. Interpret this average rate of change graphically.

Problem 5. Find the linear function that passes through the point $(1, 3)$ with slope -4.

Problem 6. Find the linear function shown below.



Problem 7. Find a linear function, $f(x)$, such that $f(1) = 0$ and $f(-5) = 6$.

Problem 8. A single adult leader of a Math Circle is taking children to see a new math flick in theaters. Adult tickets are \$14 and children tickets are \$10. They get a deal for a \$6 mini box of popcorn and \$3 soda for each child. They will also pay \$20 to park the bus taken to bring the children there. Find an expression representing the total cost to bring N children to this movie. Is this expression linear in N? Explain.

Problem 9. Find the linear function that intersects $f(x) = 4 - x^2$ at $x = -1$ and $x = 3$.

Problem 10. Is the point $(1, -4)$ on the graph of the linear function $\ell(x) = 3x + 1$? Explain.

Problem 11. The cost of taking C credits at a college, in thousands of dollars, for y years is given by $0.5 + 23y$.

(a) Find and interpret the slope and y-intercept.

(b) What happens if the college increases the cost of tuition? Explain.

(c) What happens if the college decreases their base fees? Explain.

Problem 12. While filling a large tank, an applied mathematician finds that the amount of water in a tank (in gallons) t hours from now is given by $G(t) = 600t - 30$.

(i) Find and interpret the slope and y-intercept.

(ii) Find and interpret $G(4)$.

(iii) Solve $G(t) = 30000$. What does this tell you?