

## Exeter Math problem set #2

1. What is the relation between the lines described by the equations  $-20x+12y = 36$  and  $-35x + 21y = 63$ ? Find a third equation in the form  $ax + by = 90$  that fits this pattern.
2. Rewrite the equation  $3x - 5y = 30$  in the form  $ax + by = 1$ . Are there lines whose equations cannot be rewritten in this form?
3. Find  $a$  and  $b$  so that  $ax + by = 1$  has  $x$ -intercept 5 and  $y$ -intercept 8.
4. Is it possible for a line  $ax + by = c$  to lack a  $y$ -intercept? To lack an  $x$ -intercept? Explain.
5. Points  $(x, y)$  described by the equations  $x = 1+2t$  and  $y = 3+t$  form a line. Is the point  $(7, 6)$  on this line? How about  $(-3, 1)$ ? How about  $(6, 5.5)$ ? How about  $(11, 7)$ ?

6. The x- and y-coordinates of a point are given by the equations shown below. Use your graph paper to plot points corresponding to  $t = -1, 0,$  and  $2$ . These points should appear to be collinear. Convince yourself that this is the case, and calculate the slope of this line. The displayed equations are called parametric, and  $t$  is called a parameter. How is the slope of a line determined from its parametric equations?

$$\begin{cases} x = -4 + 3t \\ y = 1 + 2t \end{cases}$$

7. Find parametric equations to describe the line that goes through the points  $A = (5, -3)$  and  $B = (7, 1)$ . There is more than one correct answer to this question.

8. Leaving home on a recent business trip, Kyle drove 10 miles south to reach the airport, then boarded a plane that flew a straight course — 6 miles east and 3 miles north each minute. What was the airspeed of the plane? After two minutes of flight, Kyle was directly above the town of Greenup. How far is Greenup from Kyle's home? A little later, the plane flew over Kyle's birthplace, which is 50 miles from home. When did this occur?

9. Caught in another nightmare, Blair is moving along the line  $y = 3x + 2$ . At midnight, Blair's position is  $(1, 5)$ , the x-coordinate increasing by 4 units every hour. Write parametric equations that describe Blair's

position  $t$  hours after midnight. What was Blair's position at 10:15 pm when the nightmare started? Find Blair's speed, in units per hour.

10. Find all points on the  $y$ -axis that are twice as far from  $(-5, 0)$  as they are from  $(1, 0)$ . Begin by making a drawing and estimating. Find all such points on the  $x$ -axis. In each case, how many points did you find? How do you know that you have found them all?

11. Simplify equation  $\sqrt{(x-3)^2 + (y-5)^2} = \sqrt{(x-7)^2 + (y+1)^2}$ . Interpret your result.

