<div align="center">

Eighth Set of Homework for Math 05

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Please note: You should fully justify your answers.

1 Slope

1. Find the slope of the following pair of points:
    (a) $P(2,3)$, $Q(4,5)$ 1

    (b) $M(-2,-2)$, $N(3,-5)$ $-\dfrac{5}{3}$

    (c) $P(0,-3)$, $Q(3,5)$ $\dfrac{3}{8}$

    (d) $M(-2,4)$, $N(8,-6)$ -1

    (e) $S(0,5)$, $P(3,0)$ $-\dfrac{3}{5}$

    (f) $P(-1,-4)$, $Q(-3,-10)$ $\dfrac{1}{3}$

    (g) $O(0,0)$, $P(-1,4)$ $-\dfrac{1}{4}$

    (h) $S(2,-3)$, $T(-4,-3)$ Undefined

    (i) $P(-1,4)$, $Q(1,-4)$ $-\dfrac{1}{4}$

    (j) $A(2,-5)$, $Q(2,1)$ 0

    (k) $A\left(\dfrac{2}{3},1\right)$, $B=\left(\dfrac{5}{3},-\dfrac{1}{2}\right)$ $-\dfrac{2}{3}$

2. For each set of points decide if they are *collinear*, that is whether they lie on the same line.
    (a) $A(2,4)$, $B(-3,-6)$, $C(5,10)$ Yes
    (b) $P(2,4)$, $Q(4,10)$, $R(-1,5)$ Yes
    (c) $O(0,0)$, $M(-2,-8)$, $N(5,15)$ No
    (d) $M(2,2)$, $N(3,3)$, $L(-5,-5)$ Yes
    (e) $P(3,4)$, $Q(-2,4)$, $R(-5,3)$ No
    (f) $A(1,2)$, $B(3,4)$, $C(5,7)$ No
    (g) $M(-2,-3)$, $N(1,-3)$, $L(7,-3)$ Yes
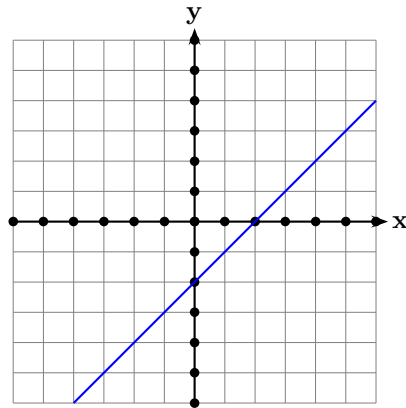   (h) $P(11,4)$, $Q(11,-7)$, $R(11,8)$ Yes

3. For each of the following equations find the slope of the line they represent by finding two points in the line and using the formula.
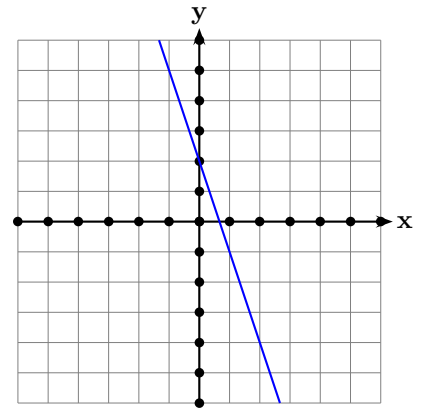   (a) $y = 3x - 2$ $m = 3$

    (b) $-2x + 4y = -6$ $m = \dfrac{1}{2}$

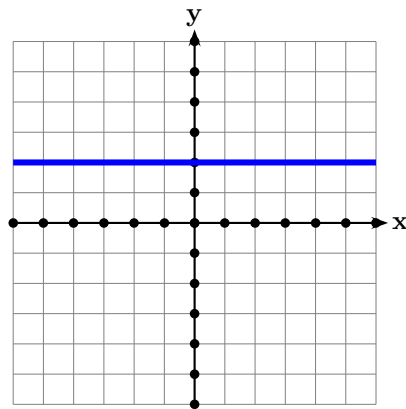   (c) $x = -5y - 7$ $m = -\dfrac{1}{5}$

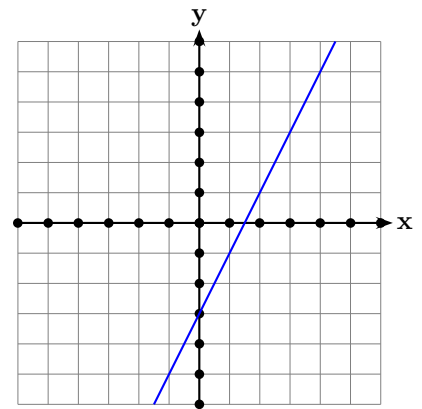   (d) $3x - 2y = 6$ $m = \dfrac{3}{2}$

(a) $m = 1$

(b) $m = -3$

(c) $m = 0$

(d) $m = 2$

Figure 1: The lines of Question 4

(e) $3(y - 2) = -5(2x - 1) + 3$ $\qquad m = -\frac{10}{3}$

4. Find the slope for each of the lines in Figure 1.

5. Put each of the following equations into slope-intercept form. What is the slope and what is the y–intercept of the line each equation represents?

   (a) $x = -2y - 6$ $\qquad y = -\frac{1}{2}x - 3$

   (b) $-10x - 5y = 7$ $\qquad y = -2x - \frac{7}{5}$

   (c) $-4x + 2y - 10 = 0$ $\qquad y = 2x + 5$

   (d) $3x - 15y - 5 = 0$ $\qquad y = \frac{1}{5}x - \frac{1}{3}$

   (e) $3y = -8$ $\qquad y = -\frac{8}{3}$

   (f) $-7x + 28y - 15 = 0$ $\qquad y = \frac{1}{4}x + \frac{15}{28}$

   (g) $-2(5x - 5) = 3(4y - 2) + 8$ $\qquad y = \frac{5}{6}x - 1$

6. A linear equation is in *general form* if it is written as:

$$Ax + By + C = 0 \tag{1}$$

where A, B, C are real numbers and at least one of the A, B is not zero. Find a formula for the slope and the y–intercept of the line with equation (1), when they exist.

Answer. When $B \neq 0$ we can solve for y to get the slope-intercept form of the equation.

$$y = -\frac{A}{B}x - \frac{C}{B}$$

So in this case the slope is

$$m = -\frac{A}{B}$$

and the y–intercept is

$$b = -\frac{C}{B}$$

If $B = 0$ then the equation can be simplified to

$$x = -\frac{C}{A}$$

In this case the line is vertical so its slope is undefined. Now if $C = 0$ then the line is the y–axis, while if $C \neq 0$ the line doesn't meet the y–axis. $\qquad\square$