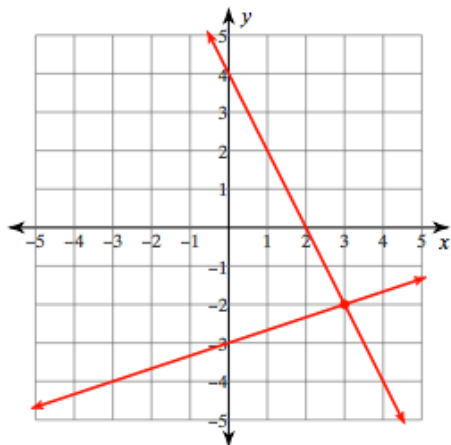**Solving Systems Graphically and Break-Even Points**
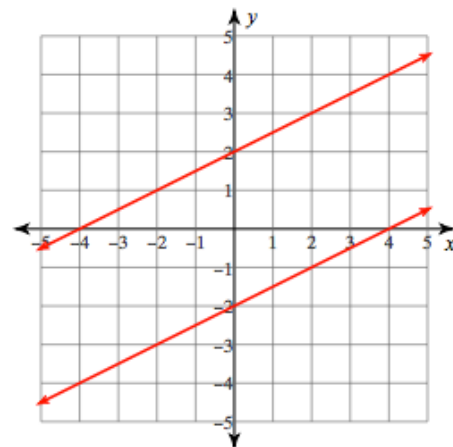
Solve by Graphing

Solve each system of linear equations by graphing. Write the equations in slope-intercept form. If system has a solution, then name at least one ordered pair (x, y). If there is no solution, state why.

1)
$$y = -2x + 4$$
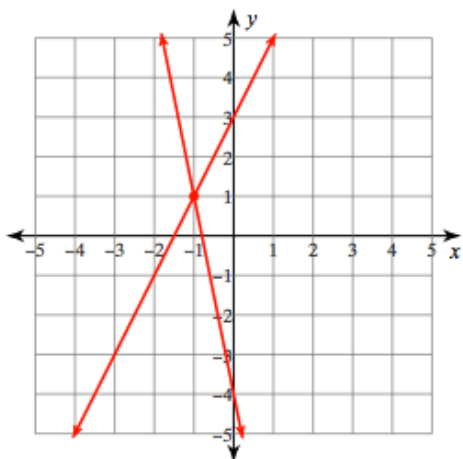$$y = \frac{1}{3}x - 3$$

(3, –2)

2)
$$y = \frac{1}{2}x + 2$$
$$y = \frac{1}{2}x - 2$$

No solution. The lines are parallel.
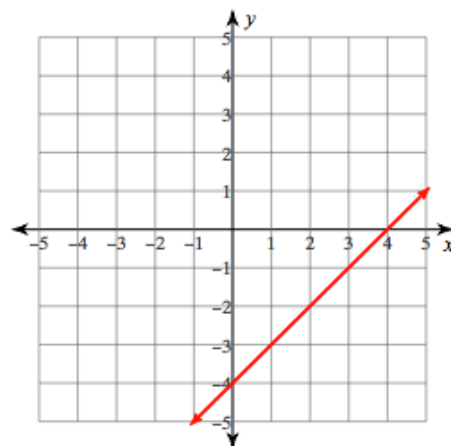
3)
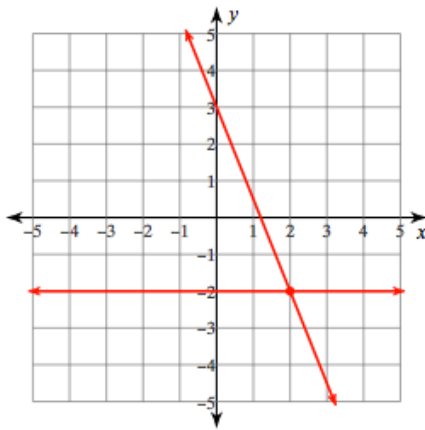$$0 = -3 + y - 2x$$
$$y + 5x + 4 = 0$$

$$y = 2x + 3$$
$$y = -5x - 4$$

(–1, 1)

4)
$$-y - 4 = -x$$
$$0 = -4 - y + x$$

$$y = x - 4$$
$$y = x - 4$$

Infinite solutions. (0, –4), (1, –3), (2, –2), (3, –1), and (4, 0)

5)
$$-12 + 4y + 10x = 0$$
$$0 = 2y + 4$$

$$y = -\frac{5}{2}x + 3$$

$$y = -2$$

$$(2, -2)$$

Break-Even Points

In the business world, the "break-even point" is the point at which income equals expenses. Solve a system of equations to find the "break-even point" for a business.

6) Suppose a club publishes a newsletter. Expenses are $.50 for printing and mailing each copy, plus $300 total for research and writing. The price of the newsletter is $2.00 per copy. How many copies of the newletter must the club sell to break-even?

Define the variables:

    x = # of newsletter copies_____

    y = total cost or total income_____

Write an equation representing the expense/cost of publishing the newsletter: $y = 0.5x + 300$_____

Write an equation representing the money earned/income from selling the newsletter: $y = 2x$_____

Set the two equations equal to each other to find the "break-even point".

    0.5x + 300 =   2x $\dfrac{300}{1.5} = \dfrac{1.5}{1.5}x$ The club needs to sell 200 copies

    <u>- 0.5x   - 0.5x</u>   200 = x   of its newsletter to "break-even".

              300 = 1.5x

7) Suppose another club publishes a newsletter. Expenses are $.80 for printing and mailing each copy, plus $120 total for research and writing. The newsletter costs $1 per copy. How many copies of the newsletter must the club sell to break-even?

Define the variables:

    x = # of newsletter copies_____

    y = total cost or total income_____

Write an equation representing the expense/cost of publishing the newsletter: $y = 0.8x + 120$_____

Write an equation representing the money earned/income from selling the newsletter: $y = 1x$ _____

Set the two equations equal to each other to find the "break-even point".

    0.8x + 120 =   1x $\dfrac{120}{0.2} = \dfrac{0.2}{0.2}x$ The club needs to sell 600 copies of its

    <u>- 0.8x   - 0.8x</u>   600 = x   newsletter to "break-even".

              120 = 0.2x