BE-Alg. 2 & Precalc | Monday 9-20-10

"Real" ACT 2nd Ed. PT3

1. On the real number line, what is the midpoint of -5 and 17?

2. If $3\frac{3}{5} = x + 2\frac{2}{3}$, then $x = ?$

3. A system of linear equations is shown below.

$$3y = -2x + 8$$
$$3y = 2x + 8$$

Which of the following describes the graph of this system of linear equations in the standard (x, y) coordinate plane?

- A. Two distinct intersecting lines.
- B. Two parallel lines with positive slope.
- C. Two parallel lines with negative slope.
- D. A single line with positive slope.
- E. A single line with negative slope.

- Time permitting ⇒ review HW 5 & Quiz 4
- Best practice problems ⇒ Real ACT
- Best topic-by-topic study guide ⇒ Barrons

BE Answers

① Mid ⇒ $\frac{-5+17}{2} = \boxed{6}$

② $3\frac{3}{5} = x + 2\frac{2}{3}$

$15 \cdot \frac{18}{5} = \left(x + \frac{8}{3}\right) \cdot 15$

$54 = 15x + 40$

$14 = 15x$

$\boxed{\frac{14}{15} = x}$

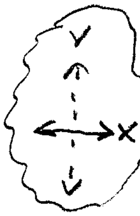
③ $3y = -2x + 8$ $\quad y = -\frac{2}{3}x + \frac{8}{3}$

$3y = 2x + 8$ $\quad y = \frac{2}{3}x + \frac{8}{3}$

$\boxed{\text{two distinct intersecting lines}}$

Functions of Two Variables

$y = f(x) = 2x + 1$ is a function "of"



one variable, x. The domain is all allowable values of x. The range is all allowable values of $2x+1$. Each x corresponds with one y.

$$x \rightarrow \boxed{\text{"f" function}} \rightarrow y$$

$z = f(x, y) = 2x + 3y$ is a function "of" two variables, x and y. The domain is all allowable values of x and y. Or in graphing terms, any allowable (x, y) pair. The range is all allowable values of $2x + 3y$. Each (x, y) corresponds with one z.

$$(x, y) \rightarrow \boxed{\text{"f" function}} \rightarrow z$$

Ex) Find $f(4,5)$

$$(4,5) \rightarrow \boxed{2(4) + 3(5)} \rightarrow 23$$

$$f(4,5) = 23.$$

OR, the ordered triple is $(4, 5, 23)$
x, y, z

You have often used functions of two variables although you may not have thought of them that way.

Ex) The area of a rectangle formula is an area function of two variables base and height.

$$A = A(b,h) = bh$$

(Ex) Find $A(4,6)$

$$A(b,h) = bh$$

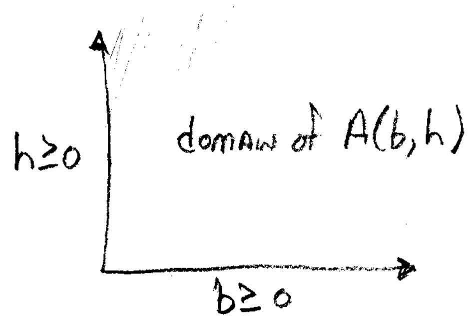
$$\boxed{A(4,6) = (4)(6) = 24 \text{ units}^2}$$

Are there any restrictions on the domain of this function?

$b \geq 0$ Since length $\neq$ negative

$h \geq 0$

$\therefore (b,h)$ must be in Quadrant I



Summary - how to find the value of any function of two variables?

Same way as you do a function of 1 variable.

- Rewrite original function
- Directly below it substitute the domain

Ex) $f(x,y) = 5x - y \quad g(x,y) = x + y$

(A) Find $f(1,-6)$

$f(x,y) = 5x - y$

$f(1,-6) = 5(\ ) - (\ )$ → You would do

$= 5(1) - (-6)$ → this on 1 line

$= 5 + 6$

$\boxed{f(1,-6) = 11}$

(B) Find $g(-2,0)$

$g(x,y) = x + y$

$g(-2,0) = (-2) + (0)$

$\boxed{g(-2,0) = -2}$

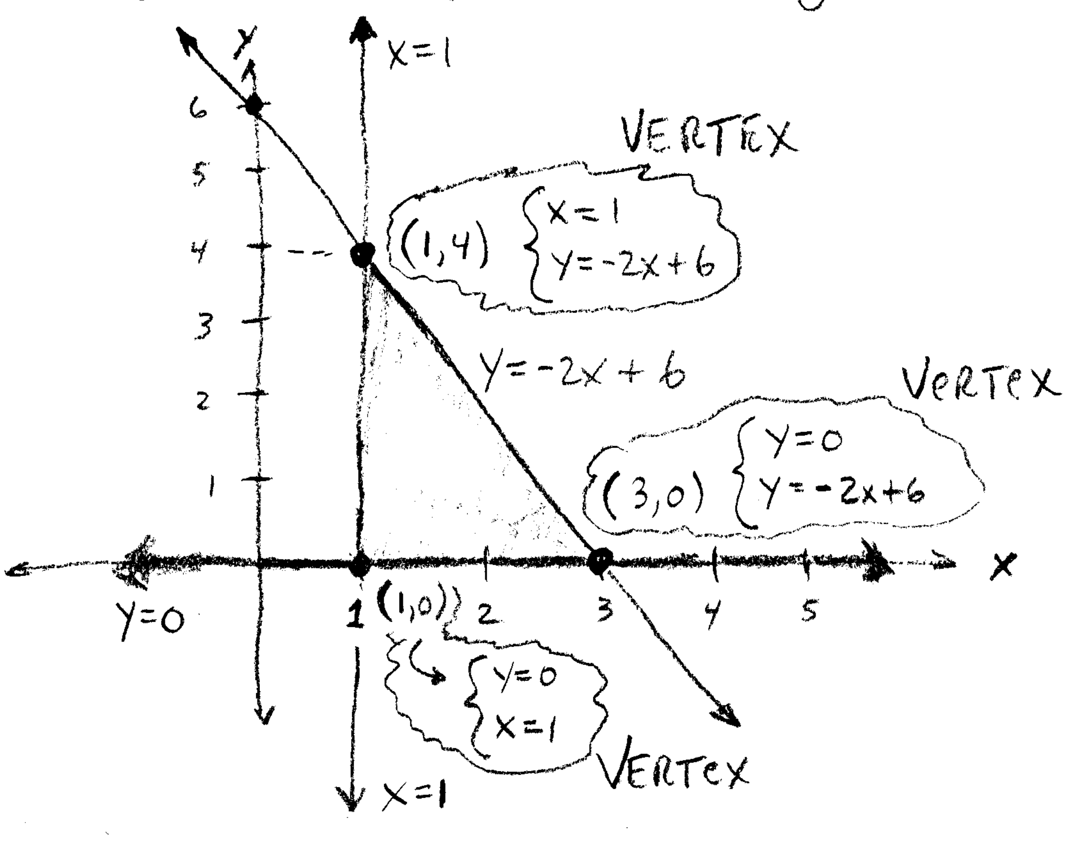
VERTEX — THE POINT (X, Y) formed by the intersection of 2 lines or line segments.

VERTICES ⇒ PLURAL

EX
Ex 1 Pg 129

The following system of inequalities forms 3 vertices when the boundary lines are graphed:

$$\begin{cases} x \geq 1 & \Rightarrow \text{vertical line at } x \geq 1 \\ y \geq 0 & \Rightarrow \text{horizontal line at } y \geq 0 \text{ i.e. the x-axis} \\ 2x + y \leq 6 & \Rightarrow \text{diagonal line at } y \leq -2x + 6 \end{cases}$$



Now, suppose you have a function of two variables whose domain (feasible region) is a set of (x,y) pairs in a shaded region defined by the graph of a system of linear inequalities (also called the "constraints").

This domain, if enclosed on all sides is called "bounded", if one side goes to ∞ it is called "unbounded"

A basic property of functions of 2 variables that have a domain that is bounded or unbounded by a system of linear inequalities is that <u>if</u> the function has a maximum or minimum value, it <u>will</u> be at one of the <u>vertices</u>!

Finding this max or min = Linear Programming = Ch. 3-4.

Steps to solve a linear programming problem ⇒

- Graph the system of linear inequalities
- Use EBS or EBA to find the coordinates of each vertex.
- Find $f(x,y)$ at each vertex and pick max or min as needed.

Continue Example 1 ⇒ given $f(x,y) = 3x + y$

Find the max and min values of the function.

⇒ Find $f(x,y)$ at each vertex

(x,y)	$f(x,y) = 3x+y$		
$(1,4)$	$3(1)+(4)$	$= 7$	
$(3,0)$	$3(3)+(0)$	$= 9$	⇒ MAX
$(1,0)$	$3(1)+(0)$	$= 3$	⇒ MIN

$f(x,y) = 9$ = MAXIMUM
$f(x,y) = 3$ = MINIMUM

Homework:
- Read 3-4
- Pg. 132 # 3, 5 (Tip: 4 vertices)