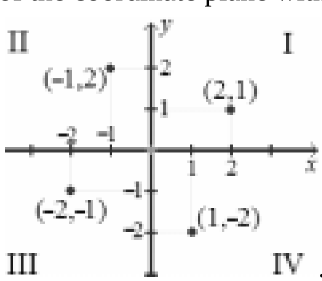
Chapter 2: Functions and Graphs
Lesson Index & Summary

Section 1: Relations and Graphs

Index

Key Topics & Formulas

- Example of the coordinate plane with points plotted in each of the four quadrants:



. *(Screens 2, 3)*

- "The domain of R" = "set of all first elements of the ordered pairs in *R*" *(Screen 3)*

- "The range of R" = "set of all second elements of the ordered pairs in *R*" *(Screen 3)*

- Example of defining a relation: *(Screen 6)*

$\left\{(x, y) \middle| \; y = x + 3\right\}$ = "The set of all points (x, y) such that y is 3 more than x."

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Section 2: Functions and Graphs

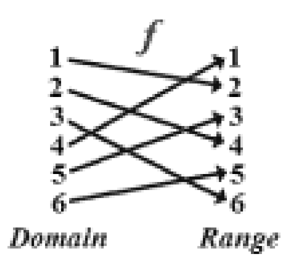
Index

Key Topics & Formulas

- A **function** is a relation in which each element of its domain occurs only once as a first element of its ordered pairs. In other words, its first coordinates are all distinct. *(Screen 2)*

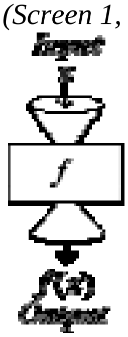
- Example of a function, its arrow diagram, and in function notation *(Screen 6)*

$$f = \{(1, 2), (2, 4), (3, 6), (4, 1), (5, 3), (6, 5)\}$$



$f(1) = 2$
$f(2) = 4$
$f(3) = 6$
$f(4) = 1$
$f(5) = 3$
$f(6) = 5$

- The "function" concept: *(Screen 1, animation on screen 7)*



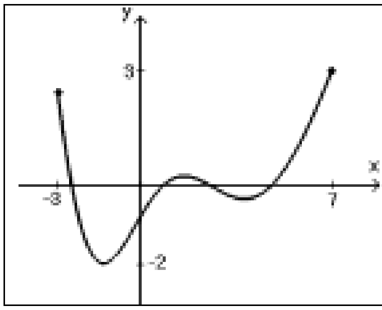
Section 2, continued…

- Example of evaluating a function:

$$f(x)=\frac{x+3}{2x}\quad\Rightarrow\quad f(1)=\frac{1+3}{2\cdot 1}=\frac{4}{2}=2\ \Rightarrow\ (1,2)$$

"An input of 1 yields an output of 2"

- Example of the domain and range of a graphed function: *(Screen 14)*

	Domain = $[-3,7]$ = "x-extent of graph" Range = $[-2,3]$ = "y-extent of graph"

- **Vertical line test**: A vertical line can cross the graph of a function at most once. *(Screen 17)*

Section 3: Linear Functions and Their Graphs

Index

Key Topics & Formulas

- Slope = $m = \dfrac{\text{rise}}{\text{run}}$ *(Screen 2)*

- When finding the rise and run, it helps to start with a positive run. This means that you start at a point on the line and form one leg of the right triangle by moving from the point to the right. Then, if the rise is positive the slope is positive, and if the rise is negative the slope is negative. *(Screen 7)*

- The slope of the line through points (x_1, y_1) and (x_2, y_2) is $m = \dfrac{y_2 - y_1}{x_2 - x_1}$ *(Screen 9)*

- To find the slope of a line with a given equation, use algebra to put the equation into **slope-intercept form**, $y = mx + b$. (Then the line's slope m is easy to see in the equation itself!) *(Screen 10)*

- In $y = mx + b$, b is the *y*-intercept. *(Screen 10)*

Section 4: Equations of Lines

Index

Key Topics & Formulas

- The ***point-slope*** equation of the line with slope m through the point (x_1, y_1) is $y - y_1 = m(x - x_1)$. *(Screen 6)*
- Vertical lines have equations like $x = C$, with C a constant; for example, $x = 2$. *(Screen 9)*
- Horizontal lines have equations like $y = C$, with C a constant; for example, $y = 3$. *(Screen 11)*
- Parallel lines all have the same slope. *(Screen 12)*
- Perpendicular lines have negative reciprocal slopes whose product is -1, like $\frac{2}{3}$ and $-\frac{3}{2}$. *(Screen 16)*

Section 5: Linear Inequalities

Index

Key Topics & Formulas

- 2-step process for graphing the solution set of a linear inequality in two variables, for example $y < x + 1$:

  1. Graph the boundary line. (For our example, we would graph the *dashed* line $y = x + 1$.)
     - The line is solid if the inequality is inclusive ($\leq$ or $\geq$).
     - The line is dashed if the inequality is exclusive or "strict" ($<$ or $>$).

  2. Decide which side to shade, using a test point. (Is $(0,0)$ shaded? Yes, since $0 < 0 + 1$.)

- Easy method for graphing the solution set of a linear inequality in slope-intercept form, for example $y < x + 1$: *(Screen 13)*

  - First graph the line. Since the inequality is in slope-intercept form, simply note that "$y <$" means "y is less than," so the side of the line that includes the solution set and should be shaded is **below** the line. (If it were "$y >$," then you would shade **above** the line.)