College Algebra

Day 8 Sections 3.4 and 3.5

Quadratic Inequalities and Transformations of Graphs

The quadratic function $f(x)=\frac{1}{9}x^2+\frac{11}{3}x$ is sometimes used to model the stopping distance for a car traveling at x miles per hour on a wet level pavement. Suppose a driver

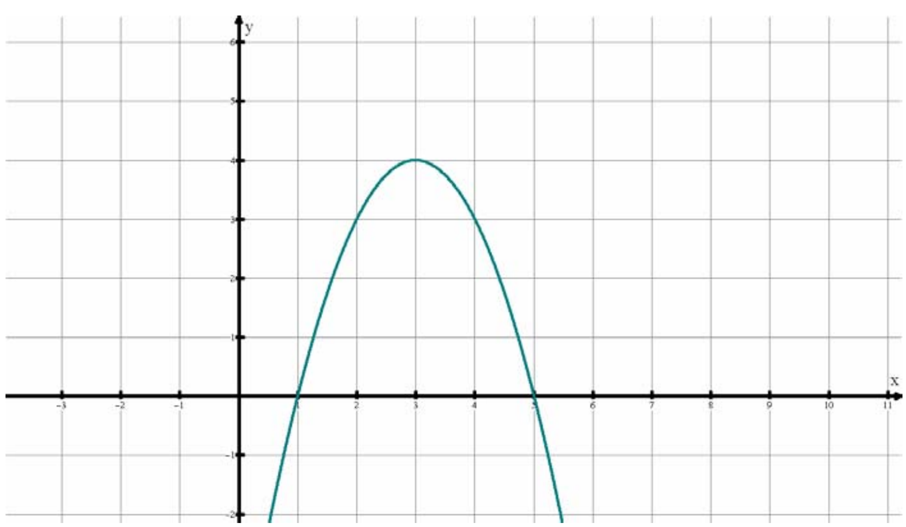
can only see 200 feet ahead, then safe driving speeds satisfy the quadratic inequality $\frac{1}{9}x^2+\frac{11}{3}x\le 200$. Solving this type of inequality is the topic of Section 3.4.

Graphical and Numerical Solution

Example: Find an equation for the quadratic function shown

1. (a) Use the graph of the quadratic function *f* to write it as $f(x)=a(x-h)^2+k$

   (b) Use the graph to solve the inequality $f(x)<0$



Example: Solve the illustration about stopping distance

Symbolic Solutions to Quadratic Inequalities

Suppose you wish to solve a quadratic inequality $ax^2 + bx + c > 0$, where > may be replaced with $\geq$, $<$, or $\leq$.

The process:

Example: Solve the following inequalities symbolically. Write the solution using interval notation.

(a) $x^2 \leq 15 - 2x$

(b) $x^2 + 4x - 3 > 0$

Application: p 220 # 65

Section 3.5 Transformations of Graphs

Translations:

Vertical

Horizontal

Transformations

Stretching-Vertically and Horizontally

Shrinking or Compressing-Vertically and Horizontally

Reflections

About the *x*-axis

About the *y*-axis

Let *f* be a function and $c > 0$

Transformation	**Effect on the graph of *f***
$f(x)+c$	
$f(x)-c$	
$f(x+c)$	
$f(x-c)$	
$c \cdot f(x),\ \ c>1$	
$c \cdot f(x),\ \ 0<c<1$	
$f(cx),\ \ \mathrm{c}>1$	
$f(cx),\ \ 0<\mathrm{c}<1$	
$-f(x)$	
$f(-x)$	

Example: Sketch the basic graph related to the following functions, then describe how the graph of each equation can be obtained by transforming the graph of the basic related graph. Make a sketch.

(a) $y = |x - 2| + 3$

(b) $y = -\frac{1}{2}(x + 3)^2$

(c) $y = -\sqrt{1 - x}$

Numerical Transformations

Example: Two functions *f* and *g* are related by the given equation. Use the numerical representation of *f* to make a numerical representation of *g*.

$g(x) = f(-x) + 1$

x	-2	-1	0	1	2
$f(x)$	11	8	5	2	-1
$g(x)$					

Students Try p 237 #86

Transforming Graphical Representations

Given the graph of $y = f(x)$ below, graph

(a) $-f(x)$

(b) $\frac{1}{2}f(x)$

(c) $f(-x)$

(d) $y = 2f(x-1)$