College Algebra — Joysheet 7
MAT 140, Fall 2017 — D. Ivanšić

Name: Saul Ocean

Covers: 3.3, 3.4, 3.5 Show all your work!

1. (4pts) Solve the equation.

$|3x-1|=7$

$3x-1=7$ or $3x-1=-7$

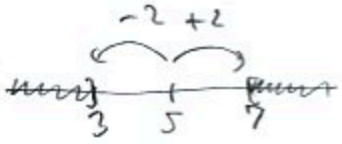
$3x=8$ $\quad 3x=-6$

$x=\frac{8}{3}$ or $x=-2$

2. (12pts) Solve the inequalities. Draw your solution and write it in interval form.

$|x-5|\geq 2$

distance from x to $5 \geq 2$

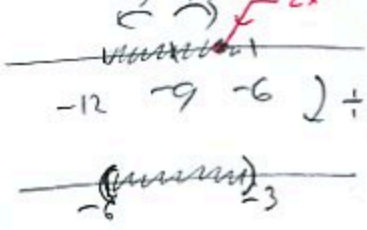


$(-\infty,3]\cup[7,\infty)$

$|2x+9|<3$

$|2x-(-9)|<3$

distance from $2x$ to $-9 < 3$



$(-6,-3)$

Solve the equations:

3. (8pts) $\frac{x+4}{x+3}+\frac{x^2-6x+43}{x^2+x-6}-\frac{x+5}{x-2}=0$ $\quad \cdot(x+3)(x-2)$

$(x+3)(x-2)$

$\frac{x+4}{x+3}(x+3)(x-2)+\frac{x^2-6x+43}{(x+3)(x-2)}(x+3)(x-2)-\frac{x+5}{x-2}(x+3)(x-2)=0$

$(x+4)(x-2)+x^2-6x+43-(x+5)(x+3)=0$

$x^2+2x-8+x^2-6x+43-(x^2+8x+15)=0$

$2x^2-4x+35-x^2-8x-15=0$

$x^2-12x+20=0$

$(x-10)(x-2)=0$

$x=2$ or $x=10$

$x=2$ gives 0 in denom

4. (8pts) $x+3=2x+\sqrt{29-5x}$ $\quad -2x$

$3-x=\sqrt{29-5x}$ $\quad |^2$

$9-6x+x^2=29-5x$ $\quad +5x-29$

$x^2-x-20=0$

$(x-5)(x+4)=0$

$x=5,-4$

Check: $5+3\stackrel{?}{=}10+\sqrt{29-25}$

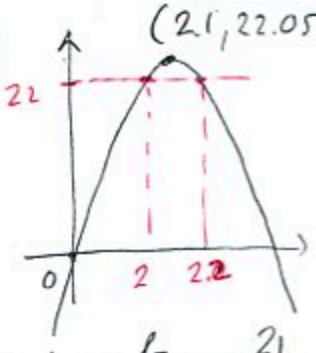
$8\stackrel{?}{=}10+2$ no

$-4+3=-8+\sqrt{29+40}$

$-1=-8+7$ yes

$x=-4$

5. (14pts) A ball is thrown upwards from the ground with initial velocity 21 meters per second. Its height in meters after t seconds is given by $s(t) = -5t^2 + 21t$.
a) Sketch the graph of the height function.
b) When does the ball reach its greatest height, and what is that height?
c) When is the ball at height 22 meters?

a) 

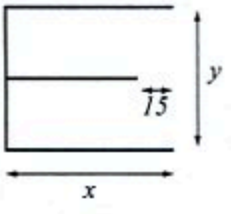
b) $t = -\frac{b}{2a} = -\frac{21}{2(-5)} = \frac{21}{10} = 2.1$ seconds to reach max. height

$s(2.1) = -5 \cdot 2.1^2 + 21 \cdot 2.1$
$= 22.05$ meters, max height

c) $-5t^2 + 21t = 22$
$-5t^2 + 21t - 22 = 0 \quad | \cdot (-1)$
$5t^2 - 21t + 22 = 0$
$t = \frac{-(-21) \pm \sqrt{(-21)^2 - 4 \cdot 5 \cdot 22}}{2 \cdot 5}$
$= \frac{21 \pm \sqrt{1}}{10} = 2, \frac{22}{10} = 2, 2.2$

2 and 2.2 s after launch ball is at height 22 m.

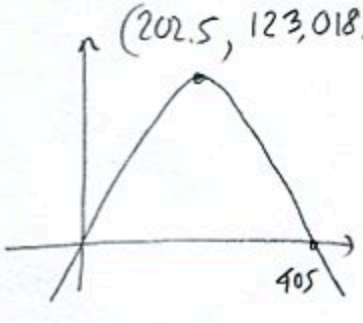
6. (14pts) Truck mechanic Igor wishes to build a repair shop with two side-by-side bays separated by a shorter wall (see picture). Igor has enough money to build 1200 feet of walls, and he wants to build a shop with maximal area.
a) Express the total area of the shop as a function of one of the sides of the rectangle. What is the domain of this function?
b) Sketch the graph of the area function in order to find the maximum (no need for the graphing calculator — you should already know what the graph looks like). What are the dimensions of the shop that has the greatest total area? What is the greatest area possible?



a) $A = x \cdot y = x(1215 - 3x) = -3x^2 + 1215x$

$2x + x - 15 + y = 1200$
$3x + y - 15 = 1200$
$y = 1215 - 3x$ (put in for y)

Domain: Must have:
$x \geq 15$ and $y \geq 0$
$1215 - 3x \geq 0$
$1215 \geq 3x$
$x \leq \frac{1215}{3} = 405$
Domain $[15, 405]$

b) 

$-\frac{b}{2a} = -\frac{1215}{2 \cdot (-3)} = 202.5$ → $1215 - 3 \cdot 202.5$

dimensions: 202.5×607.5 feet

max area: 123,018.75 square feet